THE

WESTERN JOURNAL

OF

MEDICINE AND SURGERY.

OCTOBER, 1847.

ART. I.—*Notes on Medical Matters and Medical Men in Paris.* By DAVID W. YANDELL, M.D., of Louisville, Ky.

At the time of writing my communication on Etherization applied to allay pain in surgical operations, I promised another upon its application to midwifery. At that period but few experiments had been made, and no entirely satisfactory results had been obtained; for notwithstanding the marvelous achievements of ether had astonished the world, and inspired on all sides the most pleasing anticipations of advantages still to be realized from it, there seemed a moment when the minds of the most adventurous and eminent practitioners—of those, even, who had witnessed the triumphs of this agent in allaying, what may be termed *pathological pain*, were obliged to pause after the idea had been conceived of applying the powers of ether, no more to morbid cases, but to one of nature's most noble processes, that of parturition, from which

pain, but in the *physiological* sense, is known to be inseparable. Analogy was questioned: Was pain not always pain whenever it caused the human frame to shudder or cry for relief? Curiosity urged—was the domain of this marvelous vapor to be limited to the surgical art so far only as the ablation of limbs and the division of living tissues were concerned? Reason demanded—would the antidote so signally successful against pain when produced by the bistoury, fall powerless when opposed to the pain concomitant upon the performance of certain duties of nature? The solemn laws of the healing art, and the philosophical precepts of physiology, both tended to make those who had been the most enthusiastic in regard to the conquest already gained, pause, and consider the justifiableness of the one they were about to attempt. Things could not long remain thus. Fortunate and daring leaders were upon the bank; the dangerous stream glided peacefully by; they plunged in, and obstetricians have perhaps advanced farther towards the source of nature's mysterious action than their surgical brethren have been called to do, in as much as, in the question of etherial inhalation, the former have not had to interfere with the diseased economy, like the latter, but with a physiological phenomenon at the highest degree of action. And to the honor of obstetricians be it said, they have acted with the most praiseworthy reserve, and with a due reverence for nature whenever they have employed this agent during parturition. Indeed it is to the prudent investigations of the delicate question in hand,—the intervention of an agent abolishing pain in labor, that we are indebted for, we may say, the first regular system of well planned and well conducted experiments on etherization. Enthusiasm and confidence reigned supreme at first. When nature became more deeply involved by the attempts made to modify her ways, cool reason, prompted sometimes perhaps by a growing timidity, assisted to temper this interest, to awaken a calmer spirit of inquiry, and compel a more rigid and safe method of research. Theory and practice have both obtained a certain degree of advancement and certitude in the conflict. The phenomena

displayed during the parturition of etherized women have elicited interesting questions relative to the action of the cerebro-spinal ganglionic system; it now remains with the physiologists to pursue their researches in that direction. Pain has been abolished for a certain period of labor, without any apparent disturbance having arisen throughout nature's course. These practical facts have been principally illustrated by the elaborate and truly scientific communication to the Academy of Medicine of Paris, by Prof. Paul Dubois, and by the notes published by Prof. Simpson, of Edinburgh. New facts have since then been contributed by other accoucheurs in France, whose observations we shall relate in the order in which they have appeared, thereby, possibly, accomplishing in as succinct a way as any other the object of this paper, which is to give the American reader an idea of the actual state of etherization applied to midwifery in this country. I shall begin, after a few preliminary remarks, by a detailed account of Baron Dubois' communication to the Academy, since it continues to be the principal scientific document on the subject before us.

For this account, as well as for most of the facts contained in this paper, I am indebted to my friend, Dr. Charles J. E. Campbell, who is already favorably known to the profession both in England and Paris as a promising young accoucheur. I cannot adequately express my thanks to him for the kindness which he has displayed in placing his note-book at my disposal. These notes were taken at the sitting of the Academy of Medicine, and were further extended at Prof. Dubois' lecture upon the inhalation of ether.

The two noted champions of obstetric science in Paris and Edinburgh, Prof. Dubois and Prof. Simpson, proceeded about the same time, but on very different plans, to observe the phenomena offered by ether administered during parturition. Prof. Simpson presented to the profession certain facts relative to etherization, as they occurred to him in his practice, while Prof. Dubois established at the Maternité, and at the Hôpital des Cliniques, a series of experiments, with the preconceived

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intention of ascertaining the exact value of the method when employed in those special cases; the one, therefore, purposing, by some cursory observations, to throw out to the world the assurance of the applicability of the method; the other evidently determined to analyze the character, value, and bearing of the process when adapted to midwifery practice. In this procedure of the veteran French obstetrician, we have another evidence of the sagacious and philosophical spirit which forms the distinguishing trait of the Professor of obstetrics at the Maternité of Paris.

Baron Dubois, as expressed by himself in his communication to the Academy of Medicine, on the 23d of February last, felt greatly embarrassed when he began his investigations concerning etherial inhalation in parturient women. Up to the period we have just stated, there existed but few allusions to the matter, and but three instances were known in which ether had been employed in the practice of midwifery. Dr. Bouvier, in the Academy of Medicine, and M. Velpeau, at the Academy of Sciences, while speaking of the influence of this agent in medical and surgical cases, had merely expressed the opinion that it was not improbable, that the use of ether would be found efficient in certain cases of the obstetric art. The surgeon of La Charité had so far extended his views on this point as to say that, independently of the well known advantage of preventing pain, the agent might probably possess the power of diminishing certain muscular resistances in difficult labors, such as that of the contracted uterus in cases where turning the child became necessary. There is one case known, recorded by Prof. Stoltz, which proves, as far as one case can prove it, that this anticipation is not as yet realized.

As to the three facts to which I have adverted as existing at the time when Baron Dubois began his inquiries, the first, constituting a kind of transition from surgical operations to those necessitated by difficult labor, is one in which the cæsarian section was performed by Dr. Skey, of Bartholomew's Hospital, in London, on the 23d of January, and which was

but imperfectly reported at the time. The second case, anterior in date to the first, is one of turning, performed by Prof. Simpson, on the 19th of January, and given in the notes published by the Professor on the 22d of March. The third was a case of application of the forceps, in the etherized state, performed by Dr. Des Champs, and published in the *Gazette des Hôpitaux.* With these few precedents to be found at that period in this department of science, and amidst the most sanguine expectations on the part of the scientific world as to the event, Prof. Dubois commenced the investigations now about to be related.

The Professor began by an allusion to the feelings which naturally and unavoidably arose in the mind of one who, unprecedented as it were, had to enter a field of phenomena never witnessed before; and, after dwelling upon the difference of his position from that of the French surgeons, who had instituted their operations after the American and English surgeons had communicated to the world the result of their experience, he proceeded to divide his inquiries into the following heads:

1. *Can ether be the means of preventing pain in operations of midwifery?*

2. *Can ether suspend and annihilate the physiological pains of natural labor?*

Before attempting to give a direct solution of these principal questions, Prof. D. deemed it necessary to investigate the following important points, the elucidation of which will furnish the best elements for a proper answer to the whole of the inquiry. Thus, he desired to ascertain *whether ether could be prejudicial to the mother primarily? If it could inflict any injury on the child also?*

Whether this agent, after having exerted a stupifying action on the cerebro-spinal nerves, would not induce a paralyzed state of the uterus?

Whether being innoxious primarily, ether might not, consecutively, act on the constitution of the mother or of the child?

As to the action of ether on the child, no one, said Prof. Dubois, can entertain a doubt, considering the diffusibility of its vapor, that when introduced into the mother's system by a large and active surface like that of her respiratory organs, it may pervade the child's system also, by means of those vascular communications existing between the mother and the fœtus. It was natural to examine the very delicate question of the possible amount of this influence, and it will be acknowledged, after hearing the facts I have to relate, that my anticipations have been realized so far as the penetration of ether through the system is concerned, but not in the least, I am happy to say, as to the dangers thereon attendant. On examining the question of the effects of ether on the mother, we find arguments of a special nature, drawn from facts already noticed, during the inhalation of ether in other circumstances. Cases have been witnessed in which the precursory signs of intoxication have consisted in an involuntary, disorderly, and convulsive agitation of that muscular system which is subservient to volition; in some cases also, the intoxication induced by ether has been itself characterized by a kind of epilepsy, or catalepsy, and has either been accompanied, preceded, or followed by convulsions. Now, if through life, we look for a physiological condition in which there may be found a predisposition to phenomena of this kind, we shall remark, undoubtedly, that pregnancy itself acts, but too frequently, as a predisposing cause to that species of nervous excitement which, in some cases, brings the subjects to a fatal end. I allude, as will be understood, to *puerperal convulsions*. It is therefore manifest that ether, during the pregnant state, cannot be exhibited with too great circumspection. In the course of this communication I shall have occasion to relate a case which came under my own notice, and which partially confirms the natural apprehension that ought to be entertained on this subject. This apprehension is moreover corroborated by facts observed in medical practice. Thus, Prof. Piorry brought before the Academy, at the last meeting, cases of hysteria in which he administered ether as a sedative,

and in which the fits, far from being changed for the better, were, on the contrary, rendered more intense, epileptic phenomena having been induced. Another example, illustrative of a similar effect, is founded on the fact of a physician, acting on the same preconceived notion of the sedative powers of ether, having administered this agent to patients laboring under epilepsy, and the attacks having been thereby renewed with far greater intensity than before. And again, it appears that ether was tried in England in a case of tetanus, for the same purpose; namely, of subduing nervous irritability and muscular contraction, but without any successful result. It fortunately happens, however, that in our cases those apprehensions have not been confirmed by accidents of this nature.

Having thus laid before the Academy the scrupulous considerations under which he labored for some time, and which he still desires should be maintained in the minds of the profession, on account of the very small number of experiments hitherto made on the subject, Prof. Dubois next proceeded to examine the principal question. 1. *Does ether prevent pain during obstetrical operations?* This he illustrated by cases, as follows:

Case I. A woman æt 18, primipara, entered the hospital of the Maternité, February 15th; labor had already lasted 28 hours; the uterine contractions were feeble, slow, and of an intermittent nature. I thought I should probably accelerate the pains by perforating the membranes. I did so, but no change taking place ergot of rye was given; but this again was not followed by the desired result. It was then that I decided on applying the forceps, having previously placed the patient in a state of insensibility by the inhalation of ether. This was accomplished with difficulty, the woman seeing no necessity for it, and being disturbed by the inhalation which she said was very disagreeable. In the course of six minutes, however, she fell into an apparently insensible condition. I then attempted to introduce the first blade, but at that moment she made a short, abrupt motion with one thigh. I therefore postponed the introduction of the instrument and caused the

patient to resume inhalation for two minutes; after which a kind of soporose quiet was brought on, and the first blade was introduced; the placing of the second blade, the prehension of the child's head, the locking of the forceps and the extraction of the child proved very easy. *During all the manœuvre there absolutely was not the least pain.* The expanding of the perinæum and the dilatation of the vulva were so rapidly effected, that I was enabled to terminate labor in a shorter time than nature generally takes to complete the process after it has arrived at the same stage. The child was living. The cord beat 160 times a minute, but within a few minutes after birth the pulsations of the child's heart fell to their normal state—from 136 to 130 per minute. Here we may inquire whether the child had suffered from long labor, from the application of the forceps, or from the ether? I shall presently allude to another case in which the same derangement in the fœtal circulation took place, and where it could not be attributed to long labor, or to any interference of art, the case being a natural one. In the present case, the woman very soon regained her consciousness, and being asked, 'are you delivered?' she stretched both her hands down across her abdomen and answered—'Why, sir, I see I am.' 'Did you suffer at all?' 'No sir'—'although,' said she, 'I felt as if I were surrounded by attendants who came here to deliver me.' This woman had evidently been in a state of complete insensibility, though of imperfect consciousness. The dull perception she evinced of what had been going on around her may be attributed to her having witnessed, before inhaling the ether, the preparatory disposition made for her delivery.

Case II. A woman æt 19 years, having reached the term of pregnancy, came to the Maternité with lingering pains that had existed for thirty-six hours. She felt greatly fatigued. I considered this a proper case for using the forceps. The patient was made to inhale the ether for ten minutes, a few interruptions having necessarily taken place, after which apparent insensibility came on. I began applying the instru-

ment, but the movements and loud cries of the woman at that moment induced me to readminister the ether. We did so for five minutes, when stertorous sopor was brought on, during which the forceps were easily applied. The patient then began to be somewhat agitated and uttered shrieks; delivery, however, was rapid. The perinæum appeared to stretch out with greater facility than usual. The woman then seemed to become conscious of what was going on, when I said to her—'Are you delivered?' She answered, 'yes.' 'Did you suffer?' 'No,' 'Do you remember having felt any pain or uttered any loud cries?' 'No, sir, I can remember nothing of the sort.'

The Academy will notice, said M. Dubois, that in these two cases ether produced different effects, sensibility having been annihilated without the suspension of consciousness, in the first case; whilst, in the second, sensibility was affected in the same degree as in the first, with the difference that consciousness was also totally abolished. Facts of this nature have already been so often presented to the attention of the Academy, that I deem it unnecessary to dwell any longer upon them. The only thing I wish to observe is, that both cases, but especially the first, tend to establish the proposition, that ether may be employed in the practice of midwifery, as it has hitherto been in surgery; that is, to prevent pain during obstetrical operations.

2. *Can the inhalatian of ether suspend the physiological pain attending natural labor; and can it suspend the contractions of the uterus and of the abdominal muscles?*

These questions, said Prof. Dubois, are not only of vast experimental and physiological import, but give rise to practical views the value of which no one will be inclined to doubt. The physiological point of the question is, to ascertain whether or not the stupifying action of ether on the cerebro-spinal axis, and the paralysis of the muscular system under the control of the latter, will extend to the uterine parietes. At this period, remarked the professor, the question of uterine innervation is still an unsolved problem. Scientifically speaking, it stands thus—the uterus receives its nerves,

perhaps exclusively, as is the opinion of Longet, from the ganglionic system, on which, however, the spinal cord may exert certain influences arising from the communications existing between the two. Nevertheless it remains an evident fact, that the uterus is an organ the contraction of which can neither be suspended nor in any way modified by volition. This fact implies that this organ receives its nerves from the ganglionic system; and if we admit the latter to be influenced in its action by that of the cerebro-spinal axis, it would probably be found that the origin of that influence is not direct. If these anatomical considerations be true, ether would appear to act exclusively upon the voluntary organs of animal life, and therefore ought not to influence the state of contractions which take place when prompted by organic vitality. I am aware that a distinguished physiologist, M. Brachet, is of a contrary opinion. He thinks the uterus is subject to the direct influence of the spinal cord. In support of his views he cites certain experiments on animals, and a morbid case observed in the human species. The experiments consist in vivisections performed at various points of the spinal cord, after which, says M. Brachet, the uterus becomes inert. The pathological fact is one of paraplegia observed in a pregnant woman. I am not prepared to gainsay the physiological facts; but concerning the case of labor in the paralytic woman, it is far from possessing the value M. Brachet would wish to claim for it; since it is asserted that an application of the forceps became necessary to help labor, at a moment when the dilatation of the orifice would allow the operations to be performed without danger. Now, I will only say this—that if in the alleged case the orifice was dilated, the dilatation could have taken place by no other cause whatever except the influence of uterine contraction. It is probable, however, that M. Brachet's opinion has in some measure prevailed among the scientific world; for many learned medical men have inquired of me recently whether ether did suspend uterine contraction. I am far from pretending in any way to decide these difficult questions. The facts I

am about to lay before the Academy have appeared to me of such a nature as to throw much light upon them; in as much, at least, as the effects produced on the nervous system, the brain and the spinal cord, may be considered a trustworthy criterion. Let this, however, be decided as it may, these cases will not prove the less curious or interesting from being seen under various other points of view. I have already mentioned, and I now recall to mind, a remark I made in the first forceps case related; namely, that at the very moment I attempted to introduce the first blade, the woman had made a kind of sudden effort which succeeded in impeding the introduction of the instrument. I now proceed to far more conclusive facts.

Case III. On the 5th of February, at 10 o'clock, A. M., I saw, in the amphitheatre of the Maternité a woman pregnant with her first child, who had reached the term of utero-gestation. She had been in pain since two o'clock that morning. The membranes were not ruptured; the dilatation of the orifice measured something more than one inch. Uterine contractions caused pains of an intense nature, which rapidly succeeded each other. To this woman we offered an immediate and total removal of pain. She immediately consented to inhale ether. The process of inhalation was occasionally interrupted by the woman becoming unmanageable during the moment of contraction; it lasted in all 25 minutes, after which she relapsed into a state of complete insensibility. At this period we witnessed a most curious and instructive though highly perplexing, phenomenon—determination of blood to the head. Her face became intensely red; her looks were set, her eyes being fixed upwards and outwards; the conjunctiva was congested to such a degree that I really could imagine blood on the point of issuing from its surface. The under lip was hanging, the tongue tinged, and spumous saliva issued from the mouth. This state lasted for three minutes. Squeezed and pricked during this period, the wowan felt nothing. During the state of insensibility, I remarked that the contractions continued, the uterus becoming glob-

ular and hard under my hand laid on the abdomen, while, *per vaginam*, my finger felt the tense bag of membranes protruding through, or rather against the orifice; these contractions were not painful in the slightest degree. Rather preoccupied with the above described state of the woman, I let, no doubt, a few contractions escape my notice, but there were two contractions which I perfectly observed and felt. After three minutes the woman recovered her senses and told me that she had not experienced the slightest pain. During the period of insensibility I had laid my ear on the abdomen, and counted the fœtal heart beating 160 times per minute. Very soon after the woman had recovered her senses I found but 140 pulsations, and two or three minutes later they had decreased to 136, the normal state; so that, in this case, as I have already stated, when alluding to it I spoke of the effects of ether on the child, the modification of the fœtal circulation could not be attributed to any other cause than the fact that the mother had inhaled ether.

Case IV. A woman æt 19 years, with child the second time, and arrived at the end of pregnancy, had been in labor since morning; I saw her at 3 o'clock, P. M., when she experienced very intense pains and uttered excessively acute shrieks. Such were her pains that she could not be made to understand that it was in her power, if she chose, to restrain, in some measure, her piercing cries, it really seeming to us that her physical powers alone could fix a limit to her wild and frantic screams. To this woman also we offered ease, and insensibility to her violent pains. To this she lent a ready ear, took the ether, and in three minutes fell into a deep soporose state; the eyes were open and set. She then quietly turned her head towards the female attendants around her bed, and beckoned to one of the midwives to draw near and kiss her. During the period of insensibility the contractions continued violent and energetic; they came and passed away in the deepest silence on the part of the woman. The bag of liquor amnii protruded against the finger introduced per vaginam; the fundus uteri hardened under the hand placed on

the abdomen, and, nevertheless, there existed a calm, death-like state of the patient, that offered, when contrasted with the energetic process going on, one of the most striking and unusual phenomena ever witnessed in the practice of midwifery. I then ruptured the membranes and instantaneously a muscular effort was made, by means of which the head plunged deep into the pelvic cavity. At this advanced period of labor the patient awoke, and parturition very soon ended amidst the ordinary series of painful phenomena. After the expulsion of the fœtus the mother thanked me mildly for the relief I had afforded her. When I asked her how she felt, and whether she remembered what had passed, she answered, she felt very well, and that she 'had dreamt.' What did you dream of? was my inquiry; but the patient turned her face aside with a smile, the peculiarity of which having attracted my particular attention, I resumed the question. On her again refusing to let me know the nature of her dream, I had recourse, in order to ascertain it, to the intermediate communication of a reputable person of her own sex, who had assisted in the administration of the ether. To the same question, proposed by this person, she answered, that she had dreamt she was beside her husband, and that he and she were engaged in those preliminaries which had led to the state in which we now beheld her.

It now remained for me to ascertain whether this kind of ebriety, the effect of which had hitherto been to prevent pain without interfering with uterine contraction, could impede, or not, the action of the abdominal muscles.

Case V. A woman æt. 18 years, came to the Hôpital des Cliniques a few days ago. Labor was in an advanced stage; the bag of waters had given way; dilatation was complete; the head deep in the pelvis. The uterine contractions in this female were very painful indeed. She readily consented to be etherized. After ten minutes she became soporose, complaining of ringing in the ears, and saying she felt herself dying. Uterine contraction, together with the action of the abdominal muscles, continued throughout in a most evident man-

ner; the uterine action becoming more and more frequent, the head and body of the child very easily and promptly cleared all the obstacles to their passage, and that without producing the slightest manifestation of pain in the woman. In this case I remarked the singularly relaxed state of the lower extremities, which had been placed, before etherization was resorted to, in the semi-flexed, angular position, according to the French custom. The moment insensibility was induced and the knees were no more supported by the hands of the assistants, the two limbs fell outwards, flat on the bed and in such a relaxed state, that they had a tendency to rotate still farther outwards had not the coxo-femoral joint proved an impediment to this exaggerated movement. The child was living, and it was its cries that awoke the poor mother, whose first thoughts and words were: 'Is it a boy or a girl?' The patient assured me she had not suffered in the least, only that it had appeared to her that she had been in the act of evacuating her fæces.

I must here subjoin a fact, which I have commonly observed in the course of my researches on the action of ether in those special cases—it is the extreme apparent laxity induced in the muscles of the perinæum. Even with primiparæ, the dilatation of those parts has been so rapid, that in the cases where parturition took place during the state of insensibility, the duration of which never exceeded fifteen minutes, the expulsion of the child has been painless; and we must remark, as worthy of notice, that one of these women bore a child weighing eight pounds, and that in her case the perinæum was not damaged in the slightest degree. I must also make the very important remark, that the uterus, after delivery in all the cases, has constantly and immediately resumed the firm, contracted state of its retracted parietes.

A last and very important question shall conclude my researches on this subject. I allude to the *consecutive effects of etherization on those patients.* None of the women who inhaled ether have experienced bad effects attributable to this agent. One of them felt her fingers benumbed for twenty-four

hours; another complained of her legs being slightly benumbed also, and for about the same length of time; after which this feeling entirely disappeared in both cases. We noticed no cephalalgia whatever, no bronchitis, no nervous symptoms of any kind. Nevertheless, two of these women died of metro-peritonitis, and precisely those two who underwent the application of the forceps. I have put to myself the question, whether the exhibition of ether did in any way contribute to the fatal result in those cases? On questions so imperfectly elucidated as those relating to the influence of ether on the animal system, and to the etiology of puerperal disease, all kinds of hypotheses may be advanced; still it appears to me that, having conceded to the doubts that may arise all the weight they deserve, we should inquire whether any other circumstances were present, apart from the inhalation of ether, that might explain, in a more natural and satisfactory manner, the serious results to which I have alluded. Should we not inquire, for instance, whether the difficulties of parturition did or did not exert any deleterious influence in the cases? Then, are we not bound to ascertain what may have been at that moment, the sanitary state of the hospital? Whether the patients, who had not been etherized, were at that period equally subject to puerperal fever? Whether mortality prevailed, and to what extent, in all these cases? And last of all, whether the *post mortem* appearances in these two females were similar to those generally observed in the bodies of such as have died of the disease?

In answer to these questions I will say, that the delivery of the two women who died did take place under circumstances that may easily account for death. The application of the forceps in itself was prompt and easy, but one of the patients had been in labor 40, and the other 38 hours; such, we are well aware, are very unfavorable preliminaries to delivery, and in these cases they proved the more untoward from the circumstance of the Maternité being at that period under the influence of a slight epidemic puerperal fever. I may add, that the disease was equally prevalent among those patients who

had not inhaled ether; that mortality prevailed to a great extent; and lastly, that the morbid lesions found on the *post mortem* examination of these two cases, were precisely and exclusively the same as those observed and recorded on the examination of other unetherized patients who died in the hospital about that period. We need not hesitate, therefore, between the choice of gratuitous hypothesis and well authenticated facts. We are bound to decide that ether, up to this moment, is not chargeable with any fatal results, and from the foregoing observations on the subject of this agent, considered in its applications to cases of midwifery, I feel myself justified in drawing the following conclusions: First, that the inhalation of ether has the power of preventing pain, during obstetric operations. Second, that it may also momentarily suspend the natural pains of labor. Third, that the state of ebriety induced by the inhalation of this vapor does not suspend uterine contractions when the latter have decidedly set in and take place at short intervals; and that it does not impede the synergetic action of the abdominal muscles. Fourth, that the state of ebriety appears to lessen the natural resistance which the perineal muscles oppose to the expulsion of the head. Fifth, and finally, that the inhalation of ether has not appeared to exert any bad influence over the life or health of the child.

Now, after hearing the foregoing conclusions it may appear natural to suppose, that the inhalation of ether being a process to which so many advantages are attached, it is a precious expedient, to be frequently resorted to in ordinary cases, by the obstetrical practitioner. Such, however, is not my opinion. The very proposal of such a thing, having no other ground than the very few facts I have communicated to the Academy, would not only appear extremely bold, but should be considered as eminently imprudent. In beginning this communication I expressed the apprehension under which I labored at first; well, the cases I have brought before the Academy may have lessened my fears, but they have not yet altogether dissipated them from my mind. You will remem-

ber that one of the women who inhaled ether went into a state bordering upon that which we designate by the term *epileptiform.* Two other women died. Now, although the morbid occurrences in the first case were of but short duration; although the fatal result, in the two other cases, arose far more probably from the influence of the epidemic than from any other cause; still, the Academy will feel that in a question of so serious a nature, the recollection of these facts ought to leave on my mind impressions of doubt and timidity. Later, perhaps, these hesitations may disappear; but even then I shall not forbear thinking, that the very nature of things must render the exhibition of ether, in ordinary cases of midwifery, a matter of very doubtful propriety. First of all it is evident, that the inhalation can never produce painless labor, from beginning to end. It is to be doubted whether insensibility could be made to last long enough for such a result; and it is more doubtful still whether such an attempt could be made without incurring positive danger, and without being amenable to the charge of criminal temerity. There remains therefore for employing ether, only the last period of labor, as in the cases where I have used it; and even then, this period, during which its exhibition has appeared the most effectual, is the one, according to all mothers the least fatiguing, the least painful of all the stages of the process of parturition.

As to the use of ether in cases where it is necessary to resort to instruments, I will only observe, that operations of this kind are often rendered indispensable by unforeseen circumstances, and that when this necessity occurs, the cases are of a very urgent nature. It is not necessary to give further developement to the propositions I lay down here, in order to show that in a great number of such cases inhalation of ether cannot be resorted to. As to the remaining cases, it may be asked whether they prove to be generally of so painful a nature as to justify the common use of a process which, even in a condition unconnected with the puerperal state, is not free from disadvantages, and which, when used under those special conditions, seems to me still less free from danger. My pro-

found conviction on the subject is, that inhalation of ether in midwifery should be restricted to a very limited number of cases, the nature of which ulterior experience will better enable us to determine.

Such was the first scientific communication made on the subject of the inhalation of ether in the practice of midwifery. Prof. Dubois has the intention, at some future time, to publish a memoir on the subject. In the mean time some additional cases have been recorded by M. M. Chailly, Bourier, Stoltz, and Danyan, which we now proceed to notice.

This memoir, by Prof. Dubois, was, as we have already stated, the first systematic attempt made in France towards ascertaining the action of etherial inhalation when applied to the practice of midwifery; and we believe the scientific world will esteem it the most important, since it gives a solution of most of the problems connected with the use of this agent. The remaining facts that have been published in Paris may so far contribute to advance the history of etherization as they serve to confirm what Dubois has already advanced, or show certain peculiarities of its action in special cases. Those facts may be given in a few pages. At the sitting of the Academy of Medicine on the 9th of March, M. Bourier related the following case:—A woman æt. 26 years, the mother of four children, entered the Hôpital Beaujon, at the full term of her fifth pregnancy four hours in labor. The pains were strong, and intense contractions took place every three or four minutes. The orifice was dilated to the size of a five franc piece. The woman was made to inhale ether about an hour before the probable period of delivery; she became agitated and fell asleep after eight minutes. M. Bourier was of opinion that uterine contractions then ceased completely—the suspension of pains lasted ten minutes, after which slight contractions returned, and three quarters of an hour after this, the pains had resumed their decided character of strength, and become more and more rapid in their recurrence. Delivery took place two hours afterwards. M. Bourier was of the belief that, in the foregoing case, ether was the means of impeding the progress of la-

bor by interfering with the uterine action; and hence concludes, that ether may suspend those contractions when they have not arrived at the last period.

Now, one may inquire, whether the case observed by Dr. B. is not one of spontaneous cessation of pains, such as is often witnessed in the beginning of labor; or whether the suspension was not the direct and immediate result of the inhalation of ether? We feel it to be difficult to give a satisfactory answer; but in view of the two first cases related by Prof. Dubois, in which the pains ceased after long labor, and before delivery was accomplished, we must own that we are inclined, as MM. Roux and Danyan have been, to adopt the first explanation.

At the same sitting of the academy, Dr. Chailly reported the case of a lady, in private practice, who presented the most unusual sensibility of the vaginal orifice. The vulva was found to be somewhat constricted which had been the case since the last labor, seventeen years before, the lady now being 43 years old. There existed also a slightly contracted pelvis. As application of the forceps became necessary after a labor of 59 hours, ether was given, the operation was effected *without pain, without the slightest laceration of the perineum, and without any ulterior accident to mother or child.* The details of this interesting case are to be found in the Bulletin of the Academy of Medicine, and also in the *Union Médicale* of March 1847.

In the *Gazette Médicale de Strasbourg*, of March 27, 1847, Dr. Stoltz relates a case which somewhat elucidates that part of the question left unsolved by the experiments of Prof. Dubois, and alluded to by M. Velpeau at the Institute; viz: whether etherial inhalation could suspend or diminish uterine contraction in certain cases, those the most difficult in midwifery—where it is necessary to turn the child in a contracted uterus. No case of the kind had occurred to Prof. Dubois, but as he had proved that ether exercised no influence over normal contractions, it was natural to believe that it would not advantageously modify the state of the uterus during pa-

thological contractions. However experience had not warranted the conclusion, Prof. Simpson's case of turning being one of contracted pelvis, when Prof. Stoltz met with a case most favorable for putting the method to the test.

A woman, æt. 24 years, came to the Clinique d'Accouchmens of Strasbourg on the evening of the 4th of March. The membranes had been ruptured since the preceding day; the uterus was strongly contracted, irregular in its figure, and tightened around a child, which presented the right arm, the right foot, and a loop of the umbilical cord without pulsation. Professor Stoltz after having brought the patient into a state of insensibility by the exhibition of ether, seized the presenting parts, but tried in vain to extract the others. The uterus, during etherization, offered an insurmountable resistance. He therefore undertook to extract one foot alone; it was only after some time that he was able to place his finger, in the manner of a hook, on the left groin, and thus he proceeded to extract the child as far as the head. It was then that he experienced the greatest amount of resistance. The woman was left to repose an hour. At last a few contractions took place, and new efforts being made, which nature seconded, delivery was easily performed. This is a very conclusive case, and the question now appears to be definitively resolved: *Etherization does not suspend either normal or pathological contractions of the uterus.*

In the May number of the *Revue Medico-Chirurgicale*, M. Danyan, professor of midwifery at the Maternité, has published a paper on the employment of ether in obstetrical practice. He presents the reader with an admirable summary of the experiments hitherto made on the subject, but adduces no new facts of his own personal observation. He introduces into his paper a passage from Longet's remarkable memoir on the subject, which is as follows: "In the midst of the general and profound collapse, says Longet, in which the organism is involved, and of the proximate danger which threatens it with destruction, an attentive sentinel is still awake. This vigilant agent of protection is the organ which

constitutes the primary motor of the respiratory mechanism. —it is the rachidian bulb. On it depends the maintenance of respiratory motion, and also the dilatation of the nares and mouth, the opening of the glottis, the elevation of the costal and scapular regions, the contraction of the diaphragm and of the *abdominal muscles*, inasmuch as they are considered muscles of respiration. Now, *effort* in general, and particularly that which accompanies parturition, is but a modification, a momentary change of the respiratory function; it is a state during which there must exist energetic contraction of the costal and scapular muscles, of the diaphragm, of the muscles of the abdominal parietes; during which, as Isidore Bourdan and J. Cloquet have justly observed, the glottis is spasmodically constricted; during which many other muscles also contract by that law of synergetic action on which Barthés has written his numerous and valuable papers. If, during etherization, in the absence of volition, respiration still goes on in all the integrity of the function, and if the bulb continues exciting the muscles which accomplish the act, the effort which is the result of the contraction of these identical muscles (those of the abdomen included) must also, it follows as a consequence, take place; for if, in the majority of cases, the muscular contractions which produce an effort are under the influence of volition, there are some instances in which they appear to be independent of the will. It is precisely this exception which we are called upon to witness at a certain period of labor, in certain operations, as lithotomy and lithotrity, in which the contractions of the uterus or bladder are irresistibly followed in their action by that of the abdominal muscles, diaphragm, etc. As to the perineum, if it ceases its contraction in parturient women under the influence of ether, as Professor Dubois has recently observed,—if its natural resistance is annihilated, and if it falls into the general collapse of the muscles of animal life, it is because the perineum does not constitute a part of the respiratory muscular apparatus, as we see that the abdominal muscles do. It is because during the effort, which is of an involunta-

ry kind, it is merely depressed under the weight of the abdominal viscera, and only opposes to the effort a *vis inertia*, principally through the medium of its aponeurotic layers. I allow, on the contrary, that during an effort directed by the will, the perineal muscles will contract, but in the same manner as many other muscles that are not under the direct influence of the respiratory centre, and simply in accordance with the law of synergy to which I have already alluded."

Dr. Campbell has taken the deepest interest in the subject of etherization in obstetric practice, and I feel very sure has made a faithful report of M. Dubois' admirable memoir. I regret that I could not avail myself of the advantage of seeing his report in the London Lancet before completing my own translation. I am persuaded, however, that the inherent interest of the subject will render your readers comparatively indifferent to any faults of style, which may be detected in a hasty performance.

A curious question is frequently propounded to those who propose employing ether to abolish the pains of labor, which is, can such an interference be justified on christian principles? "In sorrow thou shalt bring forth," was the decree of the Creator, and how, it is urged, can you render labor painless without a presumptuous contravention of the Divine will? My answer is, that the principle, if followed out, would lead to a passive submission to all the physical ills which impend our state. The vaccine virus was just such a contravention, and precisely this objection was urged against it, as it had been previously urged against inoculation for small-pox. But I do not apprehend that physicians will interpose any such objections to the use of ether in obstetrics, and therefore dismiss this topic for others of greater practical moment.

Baron Dubois, as has been seen, does not believe that the agent will become universally, or even generally applicable to ordinary midwifery practice. He is convinced that ether will be applicable to but a limited number of peculiar cases.

Professor Simpson, of Edinburgh, is much more sanguine in his views. He has pushed his experiments with great industry, and some months ago, it is stated, had used the agent in fifty cases, and in every one with perfect safety and success. Certainly, therefore, so far, the facts are in favor of his opinion. Not only in his cases, but in all the cases published, the relief from pain has been great and almost instantaneous; and, at the same time, no untoward accident has attended the ether's use. It has been alleged, that hemorrhage would be more likely to ensue; but as the uterus is found to contract as well when it is used as when it is not, I do not see why this should be so. Convulsions were apprehended; but in all the recorded cases no such accidents followed its administration.

Dubois bases his opinion that ether can never come into general use upon two principal grounds; 1st, the small number of cases which had fallen under his observation; and 2d, the impossibility, or probable danger of keeping a woman etherized for several hours. But Professor Simpson kept up the etherization in some of his cases for hours, and other obstetricians have pursued the same practice. Dr. Protheroe Smith, of London, reports cases as favorable to the practice as those of Prof. Simpson, and is quite as warm an advocate for the use of ether in ordinary cases of labor. He closes an exceedingly interesting lecture on the subject with the following remarks:

"In conclusion, I would state it as my opinion, that with pefectly pure ether, carefully administered by skilful persons, and with good apparatus, and especially by one containing an appendage with a supply of oxygen, the operation not being commenced until efficient etherization is produced, the employment of ether is not only justifiable, but promises to be instrumental in materially diminishing the dangers of operative midwifery. Probably, in natural cases it will be both sufficient and safer to carry the etherization only to the second stage, in which partial consciousness remains, but sensation is abolished; and towards the end, when the pains are ordinarily intolerable, to

induce perfect narcotism. From the results which I have already obtained, it is my intention to continue the use of this valuable agent, and I do not hesitate to state my belief, that future experience will fully confirm my present opinion."

Dr. Smith, in the same lecture, refers to other applications of ether in forms of disease allied to obstetrics, and relates that in several cases of dysmenorrhœa it acted like magic. A case of puerperal mania, he informs us, was immediately and permanently relieved by it; and late Journals make mention of cases of neuralgia, colica pictonum, and asthma, in which it was used with striking success.

Is the administration of ether attended with no danger? This is a grave question, and gravely to be pondered. We have seen that Baron Dubois does not look upon the agent as devoid of powers to do mischief. In all his cases, he believes it was innoxious, and it appears to have been equally so in the hands of Professor Simpson and Dr. Smith. Still, who can say, that however harmless, hitherto, it will never prove disastrous in its action? Time only can determine such a question. Observations must be greatly multiplied before we can be firm in such an assurance. Meantime, by oxygen and electricity, practitioners are preparing themselves against the casualties likely to arise in cases of its administration.

Paris, July 30th, 1847.

ART. II.—*Remarks on Fistula in Ano.* By WILLIAM M. BOLING, M. D., of Montgomery, Alabama.

It has been for a long time a settled question among surgeons, that the operation by incision for fistula in ano is decidedly the most successful method of treatment—the only one, in short, in the present state of our knowledge which, except under peculiar circumstances, can be resorted to with propriety. Every other course of procedure is attended with great uncertainty, and even where a cure is the result, it is generally at the expense of protracted suffering, and much loss of time; while by the method of incision a cure may be promised, with almost as much certainty of success, and as promptly, as in any other affection requiring operative measures. By all it is admitted that a spontaneous recovery is a most rare occurrence. Notwithstanding the promptness and certainty of the cure in most instances following the operation, and simple as the matter at first glance may appear, the greatest diversity of opinion exists among the highest authorities, as to the manner in which the division of the parts exercises a curative influence. As a matter of curiosity merely, I have selected passages from the published opinions of several authors, in which this difference of sentiment is manifested, and which, taken together, render it evident, I think, that the explanation of neither is satisfactory. At the same time I have no explanation of my own to offer instead of the apparently untenable ones of the authors cited.

Perhaps the most popular and generally received explanation at present is, that, to the quiescence of parts induced by the division of the sphincter ani, is the cure mainly attributable.

Druitt says: "It is extremely difficult to heal, both because the constant contractions of the sphincter and levator ani interfere with the union of its sides, and because of the passage of fecal matter into it from the bowels." It will be recol-

lected that the blind external fistula has no communication with the cavity of the intestine, and consequently that the latter of the two causes named in the above quotation can have no agency whatever in retarding the cure in such cases.

Again, the same author observes: "The grave remedy for this affection is division of the sphincter ani so as to prevent contraction of that muscle for a time, and cause the fistula to heal from the bottom."

Bush says: "The contraction of the sphincter, by separating the intestine from the walls of the pelvis will render reparation impossible. * * * To be short, as the object in dividing the rectum is to prevent contraction, and consequent separation from the walls of the pelvis, it is unnecessary to divide more than the portion which under ordinary circumstances is in a state of contraction; hence the incision ought not to extend higher than the upper edge of the internal sphincter."

Ferguesson, speaking of the division, observes: "Indeed with few exceptions the success of the operation seems chiefly to depend on this circumstance"—merely stating, in his opinion, a fact, but offering no explanation.

Samuel Cooper, in his 'First Lines,' observes: "The difficulty of healing many abscesses near the rectum, depends upon their being influenced by the action of the levator and sphincter ani muscles, which have a constant tendency to prevent the union of the granulations, and the coalescence of the sinus."

Sir Astley Cooper says: "From its vicinity to the rectum, it is influenced by the action of the sphincter and levator ani, and that these muscles have a constant tendency to prevent the union of the granulations and coalescence of the sinus. It therefore rarely happens but that the surgeon is required to assist nature by dividing the sphincter, and thus destroying its influence upon the sinus."

According to Pancoast, "The indications to be fulfilled are the laying open of the fistulous tracts and the sphincter

muscle, which dams up the fecal matter, turns it into the cavity of the abscess, and keeps up such frequent motion of the parts as to prevent the tendency to heal." Here a more extended view is taken of the advantages to be derived from the operation.

Sir Charles Bell asks, "How high may the operator go with his incision of the rectum?" and answers, "It is needless to go higher than the sphincter, for it is the sphincter which prevents the fistula from healing."

Liston says: "The object of the surgeon is to widen the outlet for a time and incapacitate the sphincter muscle from acting at all."

Boyer, in explanation of the frequent degeneration of abscesses near the anus into fistulas, observes: "Ici en effet les partes de l'absces sont formés en dehors par le basin, qui ne peut rapprocher du rectum, qui tend sans cesse, à s'eloigner du basin, par l'effet de la contraction de ses fibres musculaires." He recommends the usual operation of course, but offers no explanation of the manner in which the obstacle to the cure which he alludes to is removed by it.

It will be seen that several of the authors above quoted, appear to attach as much importance to the motions of the levator ani in preventing a spontaneous cure, as to those of the sphincter, yet are perfectly satisfied with recommending the division of the latter, though at the same time this can have little or no effect in preventing the action of the former.

The result of two cases which I have treated would seem to show, that the mere motions of the sphincter ani muscle can have but little agency in retarding the cure, and that it is not principally upon the quiescence of parts resulting from the division of fibres that the success of the operation mainly depends. In the cases alluded to (both fistulæ being complete) the external opening was situated precisely in the mesial line, between the verge of the anus and the point of the coccyx. It did not occur to me till the moment of the introduction of the bistoury, in the first case, that owing to the situation of the fistula, and the necessary direction of the incision, the sphincter ani muscle could not be divided in

the operation, but that its fibres would be merely separated, and, (the patient being a lady, who submitted to the operation with reluctance, and to whom I had given assurance of a speedy cure), I well recollect the anxiety the circumstance occasioned me, when I reflected that the quiescence of the parts, upon which I had counted for the cure, would not result from the operation. Notwithstanding the fact, however, that not a fibre of the sphincter muscle was divided in either case, the cure was complete in each before the termination of the third week from the day of the operation.

I will now make a few extracts from authors who offer other explanations of the mode of the curative influence of the operation.

Benjamin Bell, speaking of sinuses in general, says:—"Knowing that adhesion readily takes place between contiguous parts in a state of inflammation, we endeavor to make these parts inflame that we wish to adhere to each other." * * * "It may be accomplished either by the introduction of a cord of cotton or silk along the course of the sore, or by laying the sinus open through its whole length, so as to convert it as nearly as possible into the state of a recent wound."

Again; "The leading object to be kept in view in the treatment of sinuses, is the destruction or annihilation of the cavities from whence the matter is discharged." * * * * * "Where pressure can be employed, the sides of the sinuses are in some instances made to adhere by means of it; but in the fistula in ano this method of cure is indispensable." * * "The seton cannot be employed, for the irritation it would excite, would prove too severe a stimulus for the rectum, with which it would always be in contact."

"As in this situation, therefore, astringent and escharotic pastes and injections cannot be employed with safety, as pressure is inadmissible, and as cords of even the softest materials would excite a very insupportable degree of irritation; we are under the necessity of employing the only other remedy by which a degree of inflammation can be induced—a

free and entensive incision along the whole course of the sinus." But surely it would seem, if the inflammation was all that was requisite, it might be induced, and of any desired degree, by regulating the strength of the astringent and escharotic pastes and injections used. There is some other element through which the curative agency of the operation is exercised so promptly, than the mere inflammation induced by it. It is a fact which must be admitted, however, that till modern times some of the principal agents in the treatment of fistula were astringent and caustic injections and ointments; and by the inflammation, or rather the altered action induced by their application, a cure was occasionally effected. Indeed, from a fact stated by Dionis (cours d'operations) it is probable that this took place eventually in a larger proportion of cases than at the present day we are taught to believe. "Il y á environ trente ans qu' a Paris un nommé Lemoyne *acquit une grosse reputation* pour la guérison des fistules. Sa methodé consistait dans l'usage du caustique." * * * "Ceux a qui le ciseau faisoit horreur se mettoient entre ses mains; et comme le nombre des poltrons est fort grand, il ne manquoit point de pratique."

In his Surgical Dictionary, Samuel Cooper says: "The surgery required in these cases, consists in laying open and dividing the sinus or sinuses in such a manner that there may be no possible lodgment for matter." It is however a fact, that many fistulas, and such too as will not heal without the operation, and are readily cured by it, from their direction, limited extent, and free external opening, afford no possible opportunity for the collection and retention of matter, which of necessity escapes as fast as it is secreted.

Larrey says: "It appears clear to me that when this orifice (the internal opening) is not included in the section of the bistoury, the fistula continues or returns. * * * * The whole success of the operation then depends on finding the internal orifice." But if we are to infer from this, that the author means that it is the internal opening mainly that pre-

vents the healing of fistulæ, where no operation is performed, how are we to account for the indisposition to heal which exists in the blind external fistula? M. Roux, we are told, (Medico-Chirurgical Review, 1842,) "gives himself very little trouble about searching for the opening into the gut."

Sir Benjamin Brodie overcomes one principal difficulty as regards the explanation of the manner in which the incision so promptly effects a cure, by asserting that an internal opening always exists. "This," he says, "affords a very reasonable explanation of the formation of these abscesses; it is almost impossible to understand on any other ground why suppuration should take place in the vicinity of the rectum more than in any other part of the body, and why the cellular membrane there, should suppurate more than cellular membrane should elsewhere."

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"This being the case it is easy to understand the reason why these abscesses do not heal. The least quantity of mucus even from the gut, or of feculent matter issuing into the abscess is sufficient to occasion irritation and prevent healing." * * * "Why is it that the abscess does not heal? It may, as I supposed formerly, partly arise from the unfavorable locality for healing in consequence of the muscular fibres of the parts being always in motion. The levator muscle and the sphincter are constantly drawing the parts asunder, so that they are not allowed to contract, but that is not a sufficient explanation. There is an internal opening to the abscess, and now and then a little bit of feces or mucus will become infiltrated into the cavity."

This would seem a very satisfactory explanation; one indeed to which no objection now suggests itself, were the position of the author, that an internal opening always exists, in accordance with the experience of other surgeons. In this, however, considering only the views of cotemporary writers, he stands almost alone, and admitting that he is incorrect in it, the explanation thereon based, falls of course at once to the ground. That Sir Benjamin Brodie is really

in error in this respect, the positive testimony of many surgeons might be adduced. That of Boyer alone will suffice. Speaking of the blind external fistula he says:

"Plusieurs auteurs parmi lesquels ou en compte quelquesuns dont l'autorite est d'un grand poids en chirurgie, ont revoqué en doute l'existence de cette derniere espèce de fistules." * * * "J'ai partagé long-temps cette opinion, et je la partagerais peut etre encore si je n'avais en des autres preuves du contraire que le grand nombre de fistules que j'ai observé *sans pouvoir leur trouver d'orifice intense, et dans lesquelles l'incision du rectum* a eté suivie de la guérison; je pouvais penser que l'orifice fistuleux intense, rest sur un des bords de l'incision de l'intestin, n'a pas mis obstacle á la guérison et n'a donné lieu a la recidive de la fistule. Mais ayant eu occasion de dissequer le corps de plusieurs personnes mortes avec une fistule a l'anus, je me suis convaincu que chez quelques-unes ces fistules n'avaient aucune communication dans l'intestin."

Syme says: "When the fistula opens into the gut, more or less flatus and mucus must pass through it owing to the resistance which the sphincter muscles oppose to their exit by the anus, and thus adhesion or contraction in the surface of the sinus will be effectually prevented. But when the fistula is not complete, the reason why it should not heal like a sinus in any other part of the body is less apparent."

Mayo says: "It is customary to argue that the action of the sphincter externus ani is the cause which renders such an operation necessary." * * * "But the sphincter is habitually contracted, while the fistula on the other hand is a canal always open. The secretions and contents of the bowel, therefore, which are under the constant pressure of the adjacent parts have at once no escape through the anus, while they find a ready passage along the fistula, which the irritation they occasion prevents from closing.

"It is evident, however, that this account of the principle of the operation for fistula will not serve in that large class

of cases in which there exists no communication between the fistula and bowel." * * * "Yet these cases are often as difficult to manage as the others are, and equally require the same operation for their relief.

"The true occasion why a fistula ani is so slow of closing is, that it is a sinus in the cellular tissue. In whatever part of the body such a sinus occurs, the same tediousness of healing is invariably observed."

The latter assertion in this last paragraph it seems is not corrobrated by the opinions of some others, for in the quotation just above from Syme, the remark is made that, "when the fistula is not complete the reason why it should not heal like a sinus in any other part of the body is less apparent." Nor does the explanation given in the first part of the paragraph, as to the reason why fistulæ are so slow of closing seem at all satisfactory, seeing that generally after the operation they are not difficult to heal, but on the contrary are promptly cured; yet the operation does not change the original character of the tissue in which they are seated—it is still cellular tissue.

The objections to the theory which attributes the little tendency of fistulæ to heal where no operation is performed, to the motions of the sphincter and levator ani muscles, and the benefits of the operation to the quiescence induced by it are:—first, that in the operation the levator ani at least is not rendered quiescent, and the motions of the anus are therefore but imperfectly controlled; second, in some cases—as in the two which I have named—and in all probability such cases are by no means rare—it is impossible that the motions of the sphincter even can be in the least degree impaired by the operation, seeing that not a single fibre of the muscle is divided in the section of the parts under such circumstances. And yet these cases heal as promply after the operation as others. It should be remembered too that in some instances the tract of the fistula does not pass from the internal to the external opening entirely outside of the sphincter muscle,

but takes a course between its fibres, and though but a portion of the fibres of the muscle are divided in the operation, a cure, in these cases too is as certainly effected by it as in others.

This latter circumstance is equally applicable as an objection to the theory which attributes the difficulty,—as for instance in the opinion expressed by Bush, Boyer and others—not so much to the mere motions kept up by the sphincter, as to its constant contraction drawing the intestine, which forms a portion of the parietes of the fistula, from the side of the pelvis, which forms another portion; thus keeping the tract of the fistula always open, and its lining surfaces separate.

The objection to the view of Benjamin Bell, who seems to attribute the benefits of the operation to the degree of inflammation induced by it, is that by other means—as for instance stimulating injections—any degree of inflammation *may* be induced and kept up, by merely regulating the strength of the injection.

To the opinion of Samuel Cooper and others, which makes the difficulty to consist in the lodgment of matter, and the benefits of the operation to the provision of a free exit for it; it has already been objected, that there are some fistulæ requiring the operation, from which, from their free opening and direct course, the matter must of necessity be discharged as fast as it is secreted.

To the importance attached by Larrey, without any explanation however, to including the internal opening in the incision; and to the explanation of the manner in which the operation proves beneficial, by Brodie and others, who attribute the difficulty of cure to the passage of feces, flatus, and mucus into the fistula, in consequence of the contraction of the sphincter, it may be objected that the blind external fistulæ, in which this passage of feces into the cavity is impossible, equally demand, and are as promptly benefited by the operation, as those cases in which this is a possible and frequent occurrence.

Finally; it is no explanation of the manner in which the operation proves beneficial, to say that the reason why a fistula in ano will not heal without it, is that it is a sinus in the cellular tissue, unless this cellular tissue were changed by the operation into a different structure.

August 8th, 1847.

ART. III.—*Contributions to the Geology of Kentucky.* By LUNSFORD P. YANDELL, M.D., and BENJ. F. SHUMARD, M.D.

When we first thought of preparing the following paper, we proposed limiting our remarks to the Geology of the country in the immediate neighborhood of the Falls of the Ohio, the fossils of which we have been several years engaged in collecting; but having made, some months since, an excursion into the interior of the State as far as the Grayson Springs, we have concluded to give to our communication a wider range. Our researches have been directed especially to the character and relative age of our rocks as exhibited in their organic remains, and by the list of these, which we shall be able to present, identical with European species, we hope that we shall be found to have contributed something towards establishing certain important points in geology. The parallelism of the formations of America and Europe, is a subject which just now is engaging the attention of some of the first geologists of the age. It is interesting, moreover, to compare the formations of different and distant portions of our own continent. In order to this, many observations must be recorded. The field in which we have pursued our inquiries is one of exceeding interest, and the facts which we are about to communicate, as the result of our researches, it is hoped, will not be without their value in settling some of the great principles of geological science.

In our account of the formations of Kentucky, we shall commence with the lowest strata and review the formations as they present themselves in the ascending order.

On the Indiana side of the Falls of the Ohio, at extreme low water, the *Silurian* strata make their appearance, and for the distance of eight miles in a direction nearly south form the surface rocks. They are for the most part of a light greyish color, compact and durable, affording an excellent material for building purposes, for which they are quarried extensively at a number of places in the neighborhood of Louisville. On Bear-grass creek, a mile to the east of the city, the lowermost layers of this formation to be seen in this vicinity, are exposed; and here we find in considerable abundance a *Pentamerus*, resembling very closely Hall's figure in the New York Geological reports of *P. oblongus*, from the Clinton group of New York, and answering well to the description and figure, in Murchison's Silurian system, of the same fossil from the upper beds of the Caradoc formation in England. If our fossil be really identical in species, of which we entertain no doubt, then the rocks in question may be referred to the upper portion of the lower Silurian system; and may be considered as the western representative of the *Clinton group* of New York, and the *Carodoc* of England.

The coralline beds of the Magnesian limestone of Iowa and Wisconsin, and also those of Ohio and Indiana, contain numerous internal casts of a *Pentamerus*, which are probably referable to this species;* but until more perfect specimens are found it will be difficult to decide with certainty in regard to their identity.

Associated with the above we sometimes find a very large *Orthoceratite*, the species of which is yet undetermined. Professor Cobb has a very perfect specimen which he obtained

*See D. D. Owen's Geological report of Iowa, Wisconsin, and Illinois, page 78, pl. 14, fig. 40.

from these rocks near Utica, Indiana. In length it measures upwards of two feet. We also saw in Perry county, Tennessee, this multilocular shell of the same length, but here it was so firmly imbedded in the rocks that it could not be detached.

We have lately found in these strata on Bear-Grass creek very perfect specimens of *Caryocrinus ornatus*, differing from the New York specimens of this encrinite in being more elongated, and having its external markings better defined. In the same connexion we also find *Calymene Blumenbachii*, and several undetermined species of encrinites.

Considered in their lithological characters, our Pentamerus beds correspond more closely with those of New York than with those of Iowa, Wisconsin, and Ohio, the former being of a shaly, argillaceous character, while the latter are invariably magnesian.

Immediately above these beds occur a series of strata varying from twenty to thirty feet in thickness, remarkable for the number of fossils, principally *Polyparia*, contained in them. Of these the most characteristic is *Catenipora escharoides* and *Cyathophyllum dianthus*. The first is the most abundant coral found here, and is distributed through all the layers, though the upper ones contain it in the greatest abundance and perfection. The coral itself is silicious, while its matrix is calcareous, in conseqence of which the latter disintegrates readily, leaving the former beautifully preserved on the surface of the rocks. The chain-coral seems to have a wider vertical range than any other fossil found in our formations. It occurs in the upper Silurian rocks, near Dayton, Ohio, as on our Falls, and in the glades of Perry county, Tennessee, and the Magnesian beds of Iowa and Wisconsin. Dr. Troost, in his geological reports of Tennessee, mentions *C. labyrinthica*, which is now considered as merely a variety of *C. escharoides*, as occurring at Eddyville, Kentucky, in rocks which belong to the carboniferous limestone; and Dr. Clapp has found it as high up as the coal series.

Cyathophyllum dianthus, of Hall, is also occasionally met with. In New York this fossil occurs in the Onondaga limestone, a group which seems to hold a higher position than those under consideration. It is silicious in its character.

A number of corals are associated with the above, but for the want of proper works of reference they have not yet been satisfactorily determined. The descriptions and figures of *Strombodes helianthoides* and *Stromatopora polymorpha* given by Goldfuss, correspond very closely with two species from this locality, and in addition to these, a number of forms belonging to the genera *Strombodes*, *Cyathophyllum*, *Favosites*, *Retipora*, and *Syringapora*, are of frequent occurrence. A few varieties only of shells characterize these strata, of which two species have been identified; viz: *Terebratula Wilsoni*, and *T. reticularis*. In the glades of Perry county, Tennessee, we have also found these shells associated with *Pentremites Reinwardti*, *Caryocrinus ornatus*, and *Pentamerus galeatus*.

The foregoing are some of the most characteristic fossils which have come under our notice in our Silurian rocks, but future investigations will no doubt bring to light many other forms with which we are now unacquainted.

By reference to table I, at the end of this paper, it will be seen that many of the fossils just mentioned are identical with species figured by Hall from the Niagara group of New York; and consequently it appears that our strata on Bear-Grass, above the Pentamerus beds, and the lowermost layers on the Falls are the western equivalents of that group. The limestone of Perry county, Tennessee, containing *Caryocrinus ornatus*, *Terebrat. Wilsoni*, *T. reticularis*, and *Pentremites Reinwardti* may also, on strong palæontological grounds, be referred to the same geological age.

Immediately above these rocks a series of strata occur remarkable for the abundance of their fossils. The beds of this formation have been divided by Dr. Clapp into 1st, Lower or Coralline beds; 2d, Middle or Shell beds; and 3d,

Upper or Limestone beds. The Coralline beds rest immediately upon the above mentioned Silurian strata, and are seen to the best advantage on the Falls of the Ohio at extreme low water, at Charlestown landing, on the Ohio river, twelve miles above Louisville, and in Floyd county, Indiana, eight miles northeast of New Albany. At these localities *polyparia* occur in the greatest profusion and perfection, immense beds being made up almost exclusively of these forms. The laminæ of the rocks separate easily on the planes of deposition, so that good specimens of these fossils may be extricated without much difficulty. The following are some of them:

Favosites Gothlandica.—At each of these localities, and in fact wherever these rocks are exposed, this fossil is found in abundance, but the point where it occurs in the greatest perfection is Goose island, near Louisville, where it is met with of a snowy whiteness. Dr. Clapp makes a new species of the coral in which two, three, and even four rows of pores are displayed in the same specimen. F. Gothlandica has a very wide geographical distribution. In the United States, it occurs in Tennessee, Missouri, Kentucky, Ohio, and New York, and in Europe it is found at St Petersburg, Eifel, Aymestry, Wenlock, and a number of other localities.

F. hemispherica.—This fossil is abundant on the Falls, and is found in masses of a hemispherical figure, which may vary from one to ten inches in diameter. It is most commonly calcareous, though sometimes it is silicious.

F. maxima. (Troost).—This coral, associated with the above, also occurs abundantly on the Falls of Ohio. It is silicious or silico-calcareous. It also occurs in Floyd county, Indiana, and in Iowa and Wisconsin.

F. polymorpha.—The best locality for this coral is Goose island, where it may be obtained in great quantities, varying from one line to four inches in diameter, and a foot or more in length. It is also found in Ohio, New York, Iowa, and Wisconsin. In Europe it occurs at Ludlow and Esthonia, in Silurian, while at Eifel, Plymouth, and Paffrath it is found in

Devonian strata. The coralline beds contain also *Favosites spongites*, and *F. basaltica.*

Astrea rugosa.—A coral, identical in species with one figured by Hall in the New York Geological reports under this name, is found on the Falls, and at Charlestown landing. It is also found in Iowa in great masses, where it is commonly known as the Iowa marble. (See review of N. York Geological reports in Silliman's Journal, 2d series, vol. 1, p. 60, fig. 2).

Syringapora tubiporoides.—This beautiful coral is rare. The only specimens we have seen were obtained from the Falls. It is always silicious, and what is extraordinary, is almost invariably found incrusting other corals, a very fine specimen in our possession having for its nucleus the Cystiphyllum vesiculosum, and another completely investing a Cyathophyllum. Three undetermined species of the genus Syringapora also occur in the coralline beds, which like *S. tubiporoides* are generally silicious, and one of which, judging from the figure in Hall's report (p. 160, pl. 63, fig. 3), is identical with a species from the Onondaga limestone of New York. It is of rare occurrence on the Falls, but in Clark county, Indiana, on Bear-Grass, and in Bullitt county, Kentucky, it is more abundant, occurring at the latter locality in masses of fifty pounds weight. This is a laminiferous coral, however, and not properly a Syringapora.

Cyathophyllum gigas. (Clapp).—This is a very common and characteristic fossil, abounding at all the localities where the coralline strata are exposed, and on the Falls, frequently affording specimens two feet in length. It is both silicious and calcareous; the septa in the former case are often incrusted with perfectly formed crystals of quartz, which give to the specimens, when broken, an exceedingly beautiful appearance.

The following, as well as a number of undetermined species of this genus, are associated with the above; viz: *C. punctatum* and *C. scabrum.* Another species is occasionally met with which closely resembles *C. cæspitosum* of Goldfuss.

This is very far from being a full list of the corals yielded by the beds of which we have been speaking, but the others, if not undescribed, are at least unknown to western geologists.

The species of shells in the coralline beds are not numerous, and for the most part are limited to a single stratum; one species, however, abounds—the *Delthyris gregaria* of Clapp, which bears a strong resemblance to the *Delthyris zigzag* of Hall, from the Hamilton group of New York. Perfect specimens of this shell are not often procured. Associated with it, several undescribed species of *Gasteropoda* occur, one of which, a *Turbo*, is nearly five inches in diameter. This shell is generally silicified, and it not unfrequently happens that the interior is hollow, while the sides of the cavity are lined with finely formed crystals of quartz. M. de Verneuil is now engaged in figuring this shell for the Memoirs of the Geological Society of France. Besides those mentioned, our cabinets contain two species of Euomphalus, and one of Murchisonia from the same stratum.

Immediately above and resting on the coralline beds, we have the Shell beds of the Falls. These consist of an assemblage of strata, the different layers of which vary much in their lithological characters. Some are of a light greyish color, compact and sub-crystalline, withstand the action of the atmosphere without much alteration, and answer well for building purposes; whilst others disintegrate when exposed for any length of time to the weather. It is above this point that the *water lime*, used so extensively as a hydraulic cement, occurs.

It is on the Falls that these rocks may be studied to the best advantage, as the strata are here so plentifully charged with organic remains, that it is not easy to find a rock, which on being broken does not yield traces of them. From the Falls they extend in a north-easterly direction, forming the surface rocks for the distance of more than fourteen miles. On the road leading from Jeffersonville to Charlestown, Indiana, there are many fine localities for obtaining organic remains.

The fossils are silicious, while the rocks are soft, and crumble down into a reddish brown dust when exposed to the air, leaving the former exposed on the surface in a good state of preservation.

The lowermost layers of this group contain the following fossils:—

Pleurorhynchus trigonalis. (Hall).—A shell, which cannot be distinguished from this species found in the Corniferous limestone of New York, is common on the Falls, and on the Charlestown road, seven miles from Jeffersonville, Indiana. It is calcareous at the former, and silicious at the latter locality. We have occasionally found this shell extending into the coralline beds.

P. alæformis—is associated with the above, on the Falls, and also occurs on Lewis's creek, Harrison county, Indiana. In Europe, it is found in the Devonian rocks of Plymouth, Eifel, and Paffrath.

Atrypa scitula. (Hall).—We have no hesitation in pronouncing a little species in our cabinets from the Falls, identical with A. scitula from the Corniferous limestone of New York.

Terebratula reticularis.—This is the most common and characteristic of all the fossils of the shell beds; it has also the widest vertical range, extending from the base of the coralline beds through the various layers as far up in the series as the slate beds; nor is it confined to these strata, for we even find it in the upper Silurian rocks, which we have mentioned as occurring on Bear-Grass creek. In New York it is found in the Corniferous and Hamilton groups; and in Europe it occurs at St. Petersburg and Gothland, in Silurian strata, while at Plymouth, Eifel, Paffrath, and a number of other places, it is contained in Devonian rocks. It is calcareous on the Falls, but on the Charlestown road it is silicious, and here the spiral appendage is sometimes found beautifully preserved.

Lucina proavia. (Goldf).—This species is rare on the Falls, but is more abundant on the Charlestown road. It close-

ly resembles Hall's figure of *Paracyclas elliptica*, in the New York Geological reports, from the Corniferous limestone. Our fossil, however, is double the size of that which is there represented. It seems to hold the same stratigraphical position as the New York species, and is associated with the same fossils.

Strophomena undulata. (Vanux).—We have found this shell on Bear-Grass creek, and in Floyd county, Indiana, six miles from New Albany, in strata belonging to the shell beds. In New York it is a Corniferous species. We are not aware of its having been obtained from any other locality in the West.

Several other species of Strophomena characterize our shell strata, one of which resembles *S. radiata* from the Delthyris shaly limestone in New York. If identical, it holds in our rocks, as Mr. Hall observes, a much higher position than in the New York formations.

Pileopsis tubifer.—We have in our cabinets specimens of this shell from the Falls, with spines preserved measuring an inch in length. It also occurs on Lewis's creek, in Jefferson county, Indiana.

Calymene crassimarginata. (Hall).—The post abdominal portion of this trilobite is very common wherever the shell beds are exposed. The best locality, however, for obtaining good specimens is the Falls. In New York this fossil is from the Corniferous limestone.

Odontocephalus selenurus. (Conrad).—This species is associated with the above, but is a rare fossil in our formations. At Schoharie and other localities in New York, where the Corniferous rocks are exposed, it is said to be common. In the absence of a description and perfect specimens, we were for a long time in doubt as to the identity of the New York and western species; but a few weeks since we were so fortunate as to obtain an entire specimen, showing the tooth-like processes on the buckler, precisely as they are seen in the figure in Hall's Report. Our trilobite is much larger than that figured in the New York Reports. the post abdo-

men of some specimens in our cabinets being nearly four inches in their greatest diameter. We are not aware of its having been obtained from any other locality but the Falls.

Pterinea cardiiformis? (Hall).—We are not altogether certain that our Pterinea from the Falls is the same as that described by Mr. Hall under the above name, but it closely resembles the figure in the New York Reports, and holds the same geological position.

Of *Acroculia*, we find here three species which are probably undetermined; one variety we have regarded as identical with the *A. erecta* of Hall.

Pentremites Verneuili.—This beautiful fossil, which has been described by Professor Troost, in the Memoirs of the Geological Society of France, is as far as we are informed peculiar to the western States. It is commonly known as "the petrified hickory nut," to which in general appearance it bears some resemblance. It occupies the uppermost stratum visible near Jeffersonville, on the Indiana side of the Falls, and has also been obtained on Bear-Grass creek one mile and a half from Louisville, on Silver creek, at Carr's mills, at Charlestown, Indiana, and in the Cliff Limestone near Columbus, Ohio, in rocks equivalent to our shell beds. We obtained from the same layer, on Bear-Grass, a Pentremite which differs from any with which we are acquainted. It resembles more closely than any other a species given to us by M. de Verneuil from the Carboniferous formations in Yorkshire, England. In the pentremital stratum are to be seen many stems of *Encrinites*, and we have been so fortunate as to find the bodies of four species which are probably new. Two of them belong to the genus *Actinocrinites;* another, related to a different genus, measures five inches in diameter.

The remarkable ganoid fish figured and described by Drs. Norwood and Owen, under the name of *Macropetalichthys rapheidolabis*, from Lewis's creek, Jefferson county, Indiana, in Silliman's Journal, (vol. 1st, p. 367, new series), was broken from a layer which is equivalent to our shell beds. A short time after our attention was called by this publication

to the existence of such remains in our formations, we visited the Falls, in company with Dr. Norwood and M. de Verneuil, and were successful in finding a well preserved scutcheon plate of the same species; since which time we have found fragments of other species of fish associated with it, at the same locality, and in the same rocks at points remote from the Falls.

Of *Polyparia* we find several varieties in addition to those which are common to this group and the coralline beds. They are chiefly reticulated corals, among which the *Gorgonia infundibuliformis?* is of most frequent occurrence, as it is also considered the most characteristic. When first split from the rocks it is of a beautiful white, chalky appearance. The best locality for obtaining perfect specimens is at the Falls on the Indiana side, where it may be found in abundance. It corresponds closely to the figure and description given by Goldfuss of this species from the Silurian strata of Europe. If they are identical the American fossil holds a higher position than the European, for it occurs here in strata which are considered as the equivalent of the Devonian rocks of Europe. It is proper to remark, that Dr. Clapp has decided that this Gorgonia is not the *infundibuliformis.*

Immediately above the lower division of the shell beds of which we have been speaking, we reach the upper strata of this group, which consist of a number of layers varying in color from a light blue, to an ashy or greyish tint, and differing much in compactness. One stratum is composed of an aggregation of black rounded pebbles, held together by a kind of scoriaceous looking matter, which crumbles readily on exposure to the air, leaving the surface of the strata in some places covered with these granular bodies. These strata are scarcely less fossiliferous than the lower division of the shell beds, for almost every layer yields objects of interest to the collector. The fossils, however, do not present so great a diversity of species.

Resting on the pentremital stratum we have the water limestone so useful in an economical point of view.

The following are among the most characteristic organic remains belonging to this group:

Spirifer ostiolatus. (Schloth).—This shell is one of the most abundant, and characteristic fossils belonging to the water limestone. The best locality is Corn Island, on the Kentucky side of the Falls, where it occurs in both a silicious and calcareous state. The silicified specimens when broken, often exhibit the spiral appendages beautifully agatized, while the space between these and the shell is filled with crystallized carbonate of lime, which is easily removed by dilute muriatic acid, leaving the delicate spires untouched. It is also found silicious on the Charlestown road, seven miles from Jeffersonville, and on Lewis's creek, Jefferson county, Indiana. In the white Limestones of the Red Cedar and Wapsinonox, in Iowa, it is associated with fossils similar to those which accompany it in the shell beds of the Falls. The shell described by Conrad as *Delthyris mucronata*, from the Hamilton group of New York, is undoubtedly the *S. ostiolatus*, for we find that it is associated there with the same organic forms, and the figures of this shell, with its varieties, in the New York Reports, would answer equally well as a description of the western fossil. In Europe it is found in the Devonian rocks of Eifel, Newton, and at other localities.

With this there is another species, which cannot be distinguished from that figured by Mr. Hall as *Delthyris congesta*, also from the Hamilton group, of Seneca lake shore. Again, we find *Terebratula concentrica*, and *T. aspera*, though of unfrequent occurrence, both on the Falls and in Floyd county, Indiana. The former characterizes the Hamilton group of New York, and the Devonian strata of Eifel, Russia, Spain, and Belgium; while the latter is found at Gothland and Eifel. This limestone also yields four undetermined species of Terebratulæ.

Of the new genus *Chonetes*, we find one species exceedingly abundant—the *C. nana*, figured and described in the "Gé-

ologie de la Russie," (vol. 2d, p. 245, pl. xx, fig. 12). This species is exclusively Devonian, and in Russia occurs on the shores of the Don, near Voroneje. On the Falls it is mostly silicious, and in some of the disintegrations on Corn Island it may be obtained with its delicate spines well preserved.

Of *Pteropoda* we have two species. One of these is the *Conularia quadrisulcata* of Miller. This also occurs at Button-mould Knob, seven miles south of Louisville, in rocks which are considered as belonging to the Carboniferous system. This is an interesting fossil, as it is one among the few found in Kentucky common to two formations. In New York it occurs only in the Niagara group. An undetermined species occurs in the uppermost limestone of the Falls.

The *Calymene macrophthalma*, (*C. bufo. Green*), is quite characteristic of these upper shell beds, and is to be met with wherever these strata are exposed. In New York, it occurs in the Hamilton group; in Iowa, in the white Limestone of Red Cedar and Wapsinonox; in Indiana, it is found near Charlestown; its foreign localities are Yorkshire and Eifel. Some of our specimens are calcareous, but many are silicious.

Our cabinets also contain several corals from this stratum, among which we may mention *Cystiphyllum vesiculosum*, and *Favosites basaltica* as most abundant.

On Corn Island the water Limestone is covered by a silicious crust, which is not more than two inches in thickness. In this crust we find a small *Orthoceratite*, two, and sometimes three inches in length, with very thin septa. We have not been able to detect the position of the syphon. It is always silicious. The *Loxonema Hennahiana*, a beautiful spiral shell is very abundant at this place, and, so far as we know, this is the only locality in the western States where it has been obtained. It is figured by Phillips in his *Palaeozoic Fossils*, pl. 38, fig. 104. Its foreign localities are South Devon and Eifel, where it occurs in Devonian rocks. A small *Terebratula* and a *Turbo*, both of undetermined species, are also found here.

Immediately above, and resting on this stratum, we have a layer of a granular structure, which contains numerous species of Encrinites, with a few corals and shells. The heads, or bodies of the former are also, now and then, obtained, and our cabinets are enriched by several species from this locality. One of these belongs to the genus *Actinocrinites*, and another is perhaps a *Cyathocrinite;* whilst a third, which Professor Troost is figuring and describing for the Memoirs of the Geological Society of France, seems to be distinct from any genus yet published.

The *Slate beds* are superimposed upon this Encrinital stratum, and are best seen at New Albany, Indiana. Dr. Clapp by boring has ascertained their thickness to be one hundred and four feet at that point. In the excavations for the Louisville and Portland Canal, these beds have been cut through, their thickness on this side of the river being much less than at New Albany. They form the surface rocks for the distance of seven miles south by west from Louisville, where they are overlapped by the fine-grained sandstone of the Knobs presently to be described. The black slate here, as well as at other places where these rocks occur, are sparingly fossiliferous, only a few organic forms occurring in them, and these being confined to one or two of the lowermost layers of the mass. When newly fractured the slate is of a jet black color, owing, probably, to the great amount of bituminous matter which it contains, but after long exposure to the air it assumes a much lighter shade. Iron pyrites freely disseminated throughout the mass, either in the form of thin laminæ, or in small nodular masses, imparts to the water of the Slate district the taste of sulphate of iron. The only fossils which we have found in this formation are a small *Lingula*, and an *Orbicula;* the former, from the figure in the New York Geological Reports, is probably *L. concentrica*, (Vanuxem) from the Genessee slate; the latter, *O. Lodensis* (Vanux.) from the same slate.

Near White's creek springs, in Tennessee, on Paradise

Ridge, according to a barometrical measurement made last summer by Drs. Owen and Norwood, the black slate is 51·8 feet thick. Near the base of the hill these gentlemen found a small Lingula, which bears a strong resemblance to *L. spatula*, of the Genessee slate.

It will appear from the preceding observations, and from an examination of the table of fossils found in the vicinity of Louisville identical with European species, appended to this article, that the organic remains of which we have spoken as occurring in the strata on Bear-Grass creek, and on the Falls beneath the coralline beds, are decidedly of a lower Palæozoic type. Of twelve determined species therein enumerated as characterizing these rocks, seven forms are common to the Silurian and Devonian systems of Europe; viz: *Terebratula Wilsoni*, *T. reticularis*, *Spirifer trapezoidalis*, *Leptena depressa*, *Catenipora escharoides*, *Stromatopora polymorpha*, and *Cyathophyllum dianthus;* the remaining five species, *Spirifer lynx*, *Orthis testudinaria*, *Leptena sericea*, *Pentamerus oblongus*, and *Calymene Blumenbachii* are peculiar to the Silurian rocks. M. de Verneuil spent several days, last summer, investigating the fossils of this vicinity, and his examination enabled him to identify a number of forms which in Europe occur only in Devonian rocks; from which he was led to consider the upper beds of the Falls as belonging to that system, and to conclude that the line of separation between this system and the Silurian, is about the base of the upper coralline beds.

An examination of the tables will show twenty species from the upper beds of the Falls identical with forms occurring in the Devonian system of Europe. Of these ten are common to it and the Silurian system; viz: *Terebratula reticularis*, *Spirifer ostiolatus*, *Calymene bufo*, *Favosites polymorpha*, *F. basaltica*, *F. fibrosa*, *F. Gothlandica*, *F. spongites*, *Aulapora serpens*, and *A. tubiformis;* the remaining ten, viz:—*Spirifer cultrijugatus*, *Pleurorhynchus alaeformis*, *Productus subaculeatus*, *Chonetes nana*, *Loxonema Hennahiana*, *Pileopsis*

tubifer, *Lucina proavia*, *Venulites concentricus*, *Cystiphyllum vesiculosum*, and *Reptepora infundibulum?* are forms of organisms, purely Devonian.

Such is the result of the comparison we have made; from which it appears, that a decided analogy exists between the fossils of the upper beds of the Falls, and those of the Devonian strata of Europe, and that there are sufficient grounds for referring them to that geological epoch.

We may next compare the species contained in the western Silurian and Devonian strata with their representatives in New York.

The first table at the end of this article shows thirty-one species occurring here, which may be considered as identical with New York forms.

Of these it will be seen that the Clinton group is represented by two species, the Niagara group by six, the Onondaga limestone by five, the Corniferous limestone by nine, the Hamilton group by eight, and the Genessee slate by two; while from the above comparison, the following formations occurring in New York, above the Clinton group, appear to have no representatives in the western States; namely: the Onondaga slate and water-lime groups, the Pentamerus limestone, the Delthyris shaly limestone, Oriskany sandstone, Marcellus shale, Tully limestone, and the Portage and Chemung groups. The fossils in our strata, of which we have spoken, correspond in the order of their superposition precisely with those of New York.

Dr. Clapp has determined the thickness of all the strata of the Falls but the lowest, and we are indebted to him for the following summary, exhibiting at one view their succession and general depth:—

STRATIFICATION OF THE FALLS OF THE OHIO.

Upper Limestone.	Sub-crystalline limestone	8 feet.
	Water limestone	12 feet=20.
Shell Limestone.	Sub-crystalline limestone with many characteristic shells and trilobites, and a few corals	16 feet.
Coralline Limestone.	*Upper coralline* to catenipora, composed mostly of corals, and destitute of shells	20 feet.
	Lower coralline, corals mostly different from those above, and very few shells—the upper part alone visible on the Falls	20 feet=40+.

Seven miles south of Louisville are seen the hills known as the "*Button-mould Knobs*," in which the "Encrinital limestone" of Professor Troost occurs. These hills are composed, for the most part, of a fine-grained Sandstone, and the limestone containing the crinoidal remains appears to be a local deposit not to be seen in most of the knobs. The uppermost layers of this sandstone on many of the hills abound in a hydrated oxide of iron, commonly called "kidney ore," from which iron of a superior quality is manufactured at furnaces near Shepherdsville, on Salt river. This formation is poor in organic remains. We have found the *Orthis crenistria* and the *Spirifer cuspidatus* at a single locality; the *Conularia quadrisulcata* and a *Phillipsia* have been found in nodules of iron ore on its surface, and besides these we have not been able to detect any fossils in the fine-grained sandstone. In Europe, *O. crenistria* occurs in Devonian rocks, and at one time we were inclined to believe that our fine-grained sandstone belonged to the same system; but subsequent researches have satisfied us that it must be referred to a later geological era. *S. cuspidatus*, in Eifel and South Devon, is found in the Devonian formations, whilst in Ire-

land, as with us, it occurs in rocks belonging to the Carboniferous system.

Intercalated in the Sandstone, on a few of the knobs, is found the encrinital limestone, remarkable for the number and beauty of its fossils. Two knobs have been discovered in Jefferson, and one in Bullitt county, where this limestone is seen, and among the equivalent hills in Allen county, Kentucky, and at White's creek springs, in Tennessee, this peculiar formation also appears. This limestone which is little else than a mass of the remains of Encrinites is wanting in all the knobs near the river on the Indiana side, though we believe we have recognized it in some of the hills a few miles south of Salem, where, as at other points, it occurs among the layers of the Sandstone. Its depth below the surface of this rock varies from fifteen to a hundred feet, owing probably to the extent to which the Sandstone has undergone abrasion.

The elegant species of *Actinocrinite, plate* figure 5, *b*, is from this formation, and was obtained from the knob seven miles south of Louisville. Dr. Troost has found the same encrinite in Tennessee, at White's creek springs, and is figuring and describing it for the Memoirs of the Geological Society of France. The proboscis of this specimen is an inch and a half in length, and we have also found this appendage, belonging probably to the same species, of various shapes, sometimes bifurcated, and again assuming an irregularly branched appearance.

Besides this actinocrinite we have found here eight or ten undescribed species of crinoideans, and the plates of probably as many more, three of which we have been enabled to restore so that their specific characters can easily be made out. The plates, costal and pelvic, of one species accord very fully with the figure and description given by Goldfuss of *Cyathocrinus geometricus.* We have also found here the plates of a new species of *Pentremite;* and in the corresponding formation of Allen county, Kentucky, we obtained a beautiful species—the *P. granulatus* (Troost).

STRATIFICATION OF THE FALLS OF THE OHIO.

Upper Limestone.	Sub-crystalline limestone	8 feet.
	Water limestone	12 feet=20.
Shell Limestone.	Sub-crystalline limestone with many characteristic shells and trilobites, and a few corals	16 feet.
Coralline Limestone.	*Upper coralline* to catenipora, composed mostly of corals, and destitute of shells	20 feet.
	Lower coralline, corals mostly different from those above, and very few shells—the upper part alone visible on the Falls	20 feet=40+.

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The localities which afford these interesting fossil forms also abound in Shells, among the most characteristic of which are the following species:

Orthis Michelini.—This shell occurs most abundantly in the superior layers of the bed, where it may be obtained in countless numbers, especially at the knob in Bullitt county. It is often seen crushed and contorted into various shapes. Its geographical range is very great, for we find it described in the *Géologie de la Russie* as occurring in the Carboniferous rocks of the Oural mountains, in Russia; and it is also found in Belgium and in England.

Spirifer undulatus.—This shell is collected with the one just described, but is by no means so abundant, good specimens being rarely found.

Spirifer striatus.—This shell, which has also a wide geographical range, is three or four times as large as its European congener. In Europe it is considered one of the most characteristic of the fossils found in the carboniferous rocks.

Terebratula Roissyi.—This shell is somewhat common at this locality. One specimen in our possession exhibits in great perfection the spiral appendage. This fossil also belongs to the carboniferous system of Europe.

Productus punctatus.—This highly characteristic shell occurs abundantly with those above enumerated, and is often accompanied by

P. semireticularis.—These fossils, the authors of the Geology of Russia regard as more characteristic than any others of the carboniferous rocks of Europe. Their position is below that of *Orthis crenistria* and *Spirifer cuspidatus*, found in the sandstone of the knobs, and hence we conclude that that formation belongs to the carboniferous system.

In addition to these we find here many other species of shells, among which we may mention *Chonetes Dalmaniana* with the characteristic spines well preserved; *Conularia quadrisulcata*, and *Buccinum acutum;* besides a number not yet determined belonging to the genera *Pileopsis*, *Leptena*, &c.

Of *Crustaceæ* we find here two species, one of which resembles *Phillipsia Ouralica*, from the carboniferous rocks of the Oural mountains, figured and described in *Géologie de la Russie*, page 378, figure 16, *a*, *b*. The other belongs to the genus *Griffithides*, but its species has not been determined. Both fossils are rare.

Few *Polyparia* are found in this formation, and these belong principally to the genera *Cyathophyllum*, *Cyathoxonia*, and *Aulopora*. With the exception of a single species—*Cyathoxonia cornu*,—none have been determined.

There can be no doubt in regard to the character of this formation, for of the twelve species enumerated in the table as identical with European forms, all except one — the *Cyathocrinus geometricus*—are there peculiar to the carboniferous rocks.

Near the mouth of Salt river, on the Nashville road, the sandstone of the knobs disappears under the Carboniferous limestone. This river runs much of its way among hills composed of fine-grained sandstone, and its falls at Shepherdsville, are formed of strata which are identical with those at the Falls of the Ohio. For several miles after crossing it at that place, in a direction south, these strata are seen occasionally on the surface, and we have remarked in them the same profusion of encrinital remains found among the upper strata of some of the rocks in the Ohio, at Louisville, and have procured from them portions of a Fish, perhaps appertaining to the species plates of which we have found at the Falls. On the sides of the hills in this neighborhood, the nodular iron ore of which we have spoken occurs. Some specimens of this ore abound in the stems of encrinites, owing to which it has received, from the workmen, the name of "chocolate ore;" in others we have found the Phillipsia, which we are disposed to regard as *P. Ouralica*.

Ascending the turnpike south of Salt river, about midway the cliffs, the pentremital layers of the mountain limestone come in view, and near the summit to the east of the road,

we have found an undescribed encrinite, of the genus *Actinocrinites.* From this point to Elizabethtown, and ten miles west of that place, in the direction of the Grayson Springs, the road lies over the compact, cavernous limestone marked almost everywhere by the presence of the Barrens. Owing to this cavernous quality of the Carboniferous limestone, but few streams of water are seen in districts of country where it is the prevailing rock, while caves, subterranean streams, and sink-holes every where abound. The rivulets which descend from the hills of coarse-grained sandstone, next to be mentioned, sink and disappear as soon as they reach this limestone. This is the formation which presents us with the Mammoth Cave, and numerous other caverns of hardly inferior magnitude exist in its uppermost strata. These strata are remarkable for the regularity with which they afford the *Pentremites globosa* and *P. florialis.* We have collected specimens of these in the Mammoth Cave, and from the same interesting locality have an encrinite of the genus *Platycrinus*, which we took from the ceiling of the Fairy Grotto. Among the fossils found on the surface of this rock, at points near Elizabethtown, and in the vicinity of the Cave, we may mention the *Lithostrotion floriforme*, *Syringopora ramulosa*, and a number of undetermined species, belonging to the genera *Euomphalus*, *Productus*, *Bellerophon*, and *Terebratula.* They are generally found silicified, especially the corals, the rocks in which they were originally imbedded having worn away, and left them exposed on the surface.

On the road to Litchfield, about ten miles west of Bowling-green, the coarse-grained Sandstone, the first of the coal series, makes its appearance in an abrupt hill, and from this point to the Grayson Springs it is the surface rock, except where it has been eroded by streams of water down to the mountain limestone. This is the case at the Springs, and it was in the superior strata of the limestone at this place, that we met with the richest deposit of *Crinoidea* which we have anywhere yet found. Prof. Cobb had visited the Springs before us, and the beautiful specimens which he brought

away, one of which Drs. Owen and Norwood have figured (see their Researches among the Protozoic and Carboniferous Rocks of Kentucky) induced us to make a thorough exploration of the locality. The spot at which these fossils were preserved in such perfection, is within three hundred yards of the mineral springs, and is so limited in extent, that we left it with the impression that we had exhausted it of its treasures. In this narrow space, not exceeding forty feet square, we found seven or eight species of Encrinites, belonging to nearly as many genera. The rock in which they were imbedded is the superior layer of the limestone, immediately under the coal series. A spring of water that issues after copious rains had washed out and exposed some of the finest specimens; many were picked up on the top of the ground, and others were raised a few inches below the surface. Beyond these narrow limits we searched the rocks in vain for the fossils which we had found there in such profusion, and the fact appears to us worthy of note, as illustrating the habits of this extinct race of beings. As at this place, their remains, we believe, have generally been found in circumscribed deposits, showing a gregarious tendency in the animals. The lily encrinite of Europe seems to be confined to a single locality. We have mentioned that the fine *Actinocrinite* figured in the plate, occurs at but a single locality in Kentucky, and the *Caryocrinus ornatus* appears in our neighborhood in a single stratum. The *Cyathocrinus ornatissimus*, of Hall, appears to be quite as limited in its distribution.

How many of the Encrinites discovered in Grayson are new, we have not been able to satisfy ourselves in the absence of the latest works on the Crinoidea, but, most of them we take to be undescribed. Several belong to the genus *Cyathocrinus*, and some do not come within the definition of any of the genera known to us. One, *plate* figure 1, we name, provisionally, *Cyathocrinus florialis*, presenting as it does, with its long arched stem, a striking resemblance to a flower; and for the one resembling the human hand with the fingers compressed and extended, figure 2, we propose the

name *Cyathocrinus maniformis.* The very remarkable form, figure 3, is unlike any drawing we have seen, and will probably originate a new genus. The costal plates very far exceed in number those of any of the genera of Miller. We found but few specimens of this interesting encrinite. The individual figured, is the more remarkable from the presence of the shell at the entrance into its stomach. The animal would appear to have been in the act of gorging an *Acroculia* at the moment when it perished, and we should be more inclined to favor this conjecture if the prey were less disproportioned to the organs of the encrinite. The carnivorous habits of the crinoideans, we believe, have been clearly made out.

These encrinites, with several other species, occur at the locality near the Springs. The last one, *plate*, figure 4, a, b, c, d, was found two miles north of Litchfield, and six miles from the Springs. Of this we collected about a hundred specimens, on a surface but a few yards in extent, and although we examined the country many miles around we found no traces of this fossilized form elsewhere.

Our attention was chiefly directed during our excursion to the discovery of Encrinites, but collocated with these fossils we found *Archimides*, *Pentremites florialis*, *P. globosa*, *Terebratula lamellosa*, *Spirifer striatus*, and *Productus punctatus*, together with many undetermined species of brachiopods.

Immediately above the limestone filled with these remains, appears the Sandstone in which coal is deposited. Coal is found in various parts of Grayson county, and some beds afford it of a very good quality, though generally they are too thin to be worked with profit.

With the limestone, nearly all traces of animal life disappear, only a stray fossil here and there being found as high up as the sandstone. In the lowermost beds of this rock, resting upon the limestone, we detected a few shells belonging to the genus *Orthis;* and in a stratum of yellow stone, which seemed to be composed of the two formations, we procured *Terebratulæ*, the teeth of one or two species of

Fish, together with fine specimens of a ***Productus*** with its long spines preserved. In strata about three hundred feet above the point where these fossils cease, coal is deposited.

Mineral Springs.—The region of which we have been speaking possesses several mineral springs, of which perhaps some notice would be expected in a memoir like the present. These Springs vary in their constitution as they are found issuing from different mineral strata, though with few exceptions they agree in containing sulphuretted hydrogen as one of their ingredients. Those found in the Cliff limestone,—the strata of the Falls,—are characterized by the large amount of *chloride of sodium* suspended in their waters; those of the Slate formation are impregnated with *iron;* while in the Grayson Springs, which occur in the Carboniferous limestone, the characteristic ingredient is *magnesia*. The sulphuret of iron, which is detected everywhere in the black Slate, accounts for the chalybeate qualities of the water percolating its beds. This sulphuret soon becomes a soluble sulphate, under the influence of moisture and oxygen, and is in a condition then to be washed out by the rains, and appear as a chalybeate spring. The sulphuretted hydrogen, which is so uniform a constituent of all these springs, no doubt owes its origin to the same sulphuret, that portion of its sulphur which is in excess combining with the hydrogen of the decomposed water to form the gas. Chloride of sodium may have been left in basins in the rocks when the sea, which there can be no doubt at one time covered them, receded into new channels; or it is possible that it exists there in the form of rock salt, in which state it is known to occur in many countries. Either hypothesis explains the presence of this salt in so many mineral waters. Magnesia enters into the composition of many rocks, and it is easy to perceive how the carbonic acid carried down by the rains, and the sulphuric acid developed from the iron pyrites by the process just alluded to, would render it soluble, and bring it to the surface in the shape of a carbonate and sulphate.

Paroquet Springs.—In a notice of these Springs in this Journal (vol. vii, p. 143, new series) it was stated that they occur in the Blue limestone. They occur not far from the point where the two formations meet, but, as has been mentioned above, among the beds of the Cliff limestone. They belong to a series of springs to which Salt river is indebted for its name. All the salt consumed in this region of Kentucky, for many years, was made from wells the remains of which, with the works for raising and transporting the salt-water, are still to be seen near this river in the vicinity of Shepherdsville. The discovery of stronger brine on the Kenawha and other places, led to such a reduction in the price of this commodity that its manufacture at these works ceased to be profitable. The Paroquet Springs differ from the wells in the neighborhood in being charged with sulphuretted hydrogen, but like the other fountains they hold in solution much table salt. Their other constituents are chloride of calcium, chloride of magnesium, sulphates of soda, magnesia and lime, and carbonates of lime and magnesia. The water is cold, and in its action purgative and alterative, adapted to cases of chylopoietic derangement, and, generally, to affections growing out of sedentary habits.

Within a few hundered yards of the main spring is another fountain, in which sulphate of magnesia is the predominating ingredient, and common salt and sulphuretted hydrogen are not found.

In the same formation, a short distance from Charlestown, Indiana, a feeble stream of salt water issues, which in early times was the resort of buffalo and deer. It is destitute of sulphuretted hydrogen, but in other respects resembles the Paroquet Springs.

The Chalybeate Springs and wells of the black slate formation have not attracted public attention; nevertheless their waters might be used with advantage in anemic and other diseases demanding a tonic treatment.

Grayson Springs.—These Springs are within four miles of Litchfield, the county seat of Grayson, and twenty miles north of the Mammoth Cave. The number of fountains is very great, though only slight differences have been detected in the character of their mineral ingredients. They are all highly charged with sulphuretted hydrogen, and contain in addition, carbonic acid, carbonate of magnesia, carbonate of lime, sulphate of magnesia, and sulphate of lime. A trace of iron has been detected in several of the springs. Their temperature is as low as that of the best common springs in the neighborhood, about 58° Fah., and their taste sweetish and not unpleasant. They have acquired much reputation for their curative powers in a variety of chronic disorders. The water acts gently upon the bowels, promotes the secretion of the kidneys and the skin, and improves the appetite and digestion. Another spring has been discovered a few miles distant from these, in the same formation, and possessing all their qualities.

In a general survey of the several formations passed in review in this memoir, the following are some of the facts which will strike the observer. He will remark, that wherever the Cliff limestone constitutes the superficial rock, the soil is rich and favorable to agriculture. Next to the regions of Kentucky in which the Blue limestone prevails, the best soil is found where the rocks of the Falls are the prevailing formation. After this comes the Carboniferous limestone of the Barrens, where the soil, although still good, is inferior to that which reposes upon the series just mentioned, with the additional disadvantage that, owing to the cavernous quality of the rocks, it is not well watered. The soil over the Black slate is adapted to the culture of small grain crops, and especially to grass, but does not produce corn or hemp as well as the limestone districts, owing to its tenacious consistency, which subjects it to the formation of ponds and marshes, and renders it generally too retentive of moisture. The regions of the Sand-

stones are poor; they embrace the 'Knobs' and 'wildernesses' of Kentucky.

The relations of these various geological groups to health and disease, are both interesting and important. Malarious affections are known to be dependent upon the joint agency of heat and moisture, and their prevalence is generally graduated by the extent to which these influences are combined. With this principle before him, the observer would be prepared to find fevers more prevalent over our Slate districts than in the others; and if he met with an exception to the rule, it would be in the Barrens, where, owing to the predominance of a tough red clay in the soil, ponds have accumulated in greater numbers. Along the streams in the Blue and Cliff limestone districts fevers prevail, but over the entire surface of the Slate, they are expected, in wet seasons especially, as regular summer and autumnal occurrences. The early history of Louisville with regard to salubrity, is well known; it was visited, in different years, by epidemics rivaling in malignity the yellow fever of New Orleans.—Built upon the margin of the Slate, it was at that time surrounded by ponds of great extent. These have been drained; the country around has been cleared and brought under cultivation, and while the "Pond Settlement" continues as unhealthy as formerly, Louisville, in latter years, has come to be a healthy city.

The Mammoth Cave and the Falls of the Ohio, will occur to every observer as the most remarkable objects in the geology of the portion of Kentucky under consideration. The caves, which on account of their size have attracted attention in this country, are all found in the Carboniferous limestone, and it is interesting, as we believe we are authorized to remark, that from Palestine to the Mammoth Cave, those of the greatest magnitude occur in the same formation. The common theory of these excavations is, that they have been wrought out slowly in the rock, by the united action of carbonic acid and water, and it cannot be doubted that these agents have shared largely in the process; but an attentive

consideration of the phenomena has led us to suppose that nitric acid also has contributed to it. Nitrate of lime is everywhere met with on the floors of these caverns, except under circumstances where water has been admitted to wash it away, showing that a portion of their solid walls has assumed that state. How much of the erosion is due to the latter acid it would not be easy to show, more especially as, from the soluble character of the nitrate of lime, but little of that salt could remain where water had access to the cave; but all the facts considered, is it not evident that nitric acid has had its share in these excavations?

The Falls of the Ohio constitute a *coral reef* unequaled, perhaps, by any bed of ancient corals known in the world. The strata exposed for miles are almost wholly made up of these fossils, many of them silicious, and all of a compact, resisting character. In this quality of the rocks, owing to which they have yielded more slowly than the strata above to the abrading influence of the river, we have, doubtless, one of the causes of the Falls. Some of the rocks, more fully charged with corals than the rest, have defied the action of the water, while in other places, where less fossiliferous, they have gradually given way and are worn into deep channels. Other causes have contributed to produce these rapids in the Ohio. The dip of the strata, though not uniform, is generally in the direction here taken by the stream, and is also greater than at points above. But, added to this, the formation succeeding to the Cliff limestone, at the Falls, is of a far more friable character, and yields rapidly to the force of the river. The limestone continuing, we should have been presented with extensive rapids, but the fall would have been slight. As it is, the water has worn away the Slate, and follows the dip of the limestone, creating a fall of more than twenty-two feet in a distance of two miles.

The Falls of Niagara occur in formations analogous to those at the Falls of the Ohio, but the relative position of the rocks is reversed. In Niagara the destructible clay slate is underneath the limestone; in the Ohio it is above, and

this creates the difference between the Falls of the two rivers. If our clay slate had been the underlying rock, then our Falls, instead of rapids, would have been a cataract.

The denuding effects of water are exhibited on an imposing scale at the Falls of the Ohio. According to an Indian tradition, the river at one time flowed on what is now the Kentucky side of Corn Island, which then was connected with the mainland on the north; and in the recollection of many of the present inhabitants of Louisville, that island extended up as high as third street, opposite the mouth of Bear-Grass. The river now, except at high stages, flows almost exclusively on the Indiana shore, and the island reaches only to 11th street, two-thirds of a mile in length having been washed away in less than the third of a century. These changes have taken place in the memory of man, but there is conclusive evidence in the strata around that far greater mutations occurred in ages more remote. At one period, the clay slate strata, a hundred feet in thickness, reposed upon the limestone at the Falls. These have all disappeared, and, borne towards the sea, have taken part in other formations. The hills of Silver creek and the Button-mould Knobs were once united; they are now seven miles asunder, all the intervening mass of rocks, more than a hundred yards in depth, having been carried away by running water. And if we conclude, as there are strong grounds for believing, that the mountain limestone of Kentucky was once connected with its equivalent in Indiana, and that the great coal fields of Illinois, Ohio, and Pennsylvania are but parts of what at one period was a continuous field, then we have many thousand feet of solid strata, several hundred miles in extent, which have yielded to this slow process of denudation.

A TABLE OF FOSSILS FOUND IN THE VICINITY OF LOUISVILLE IDENTICAL WITH NEW YORK SPECIES.

No. of Species.	GENERA AND SPECIES.	Authors and references.	Silurian System.	Devonian System.	FORMATIONS IN NEW YORK. Clinton Group.	Niagara Group.	Onondaga Limestone.	Corniferous Limestone.	Hamilton Group.	Genesee Slate.
1	Catenipora escharoides	Lam.	*	....	....	*	....	....	....	....
2	Favosites Gothlandica	Lam.	....	*	....	....	*	....	....	....
3	Astrea rugosa?	Hall	....	*	....	....	*	....	....	....
4	Cyathophyllum dianthus?	Goldf.	....	*	....	....	*	....	....	....
5	Syringapora?	.....	....	*	....	....	*	....	....	....
6	Pentamerus oblongus	Sil. res.	*	*	*	....	....	....	....	....
7	Pterinea cardiiformis	Hall	....	*	....	....	....	*	....	....
8	Terebratula reticularis	Brown.	*	....	*	*	....	....	....	....
9	" " scitula	Hall.	....	*	....	....	....	*	....	....
10	" " concentrica	Von Buch.	*	*	....	....	....	....	*	....
11	" " spinosa?	Hall	....	*	....	....	....	....	*	....
12	Delthyris mucronata	Conrad	....	*	....	....	....	....	*	....
13	" zig zag?	Hall.	....	*	....	....	....	....	*	....
14	" congesta	Hall.	....	*	....	....	....	....	*	....
15	" undulatus*	Schloth	....	....	....	....	*	....	....	....
16	Strophomena depressa	Sow.	*	....	....	*	....	....	*	....
17	" inequistria?	Hall.	....	*	....	....	....	....	*	....
18	" undulatus	Vanux	....	*	....	....	....	*	....	....
19	Pleurorhynchus trigonalis	Hall.	....	*	....	....	....	*	....	....
20	Paracyclas elliptica	Hall.	....	*	....	....	....	*	....	....
21	Euomphalus? rotundus	Hall.	....	*	....	....	....	*	....	....
22	Orbicula lodensis	Vanux	....	*	....	....	....	....	....	*
23	Lingula concentrica	Vanux	....	*	....	....	....	....	....	*
24	Calymene bufo	Green	....	*	....	....	....	*	....	....
25	" crassimarginata	Hall.	....	*	....	....	....	*	....	....
26	" Blumenbachii	.....	*	....	....	*	....	....	....	....
27	Odontocephalus selenurus	Conrad	....	*	....	....	....	....	....	....
28	Caryocrinus ornatus	Say	*	....	....	*	....	....	....	....
29	Hypanthocrinites cœlatus	.....	*	....	....	*	....	....	....	....
30	Acroculia erecta?	Hall.	....	*	....	....	....	*	....	....
31	Turbo lineatus	Hall.	....	*	....	....	....	....	*	....

* The true Spirifer undulatus occurs in this county in the carboniferous limestone of the Knobs.

A TABLE OF FOSSILS FOUND IN THE VICINITY OF LOUISVILLE IDENTICAL WITH EUROPEAN SPECIES.

Number of Species.	GENERA AND SPECIES.	AUTHORS AND REFERENCES.	FORMATIONS IN EUROPE.			LOCALITIES.	PRINCIPAL LOCALITIES OF EUROPE.
			Silurian.	Devon.	Carbonif		
	BRACHIOPODA.						
1	Terebratula Wilsoni.....	Min. Conch., p. 118, f. 3 V. Buch. Foss. Rhen. Prov.	*	*	.....	Jefferson co, Ky. Perry co, Tenn., Lockport, N.Y.	St. Petersburg, Russia, Norway, England.
2	" aspera.....	Schloth—Geol. Rus. p. 93, pl. x, fig. 12, Hall's report.	.....	*	.....	Falls of Ohio.	Gothland, Eifel.
3	" concentrica..	Von Buch—Russ. Geol. vol. 2, pl. viii, fig. 10 and 11.	.....	*	.....	Falls of Ohio, Floyd co., Ia., New York.	Russia, Spain, Eifel, Belgium.
4	" Roissyi.....	Leveille—Geol. Russ., vol. 2, p. 55, pl. ix, fig. 2.	.....	.....	*	Button-m'ld Knob, Grayson co. Ky., Floyd co, Ia.	Belgium.
5	" reticularis...	Sin.—I. prisca Schloth., Russ. Geol., p. 90, pl. x, fig. 12.	*	*	.....	Falls of Ohio, Bear-Grass creek, near Louisville.	Russia, Turkey, Spain Eifel.
6	Spirifer ostiolatus.....	Schloth, pl. 17, f. 3, Phil. Palæozoic Fossils p. 30, f. 132.	*	*	.....	Falls of Ohio, Clark co., Indiana.	Russia, Eifel.
7	" cultrijugatus.....	C. Roemer.	.....	*	.....	Falls of Ohio.	Eifel.
8	" striatus.....	Sow.—Min. Conch., vol. 3, p. 125, pl. 270, Russ. Geol., p. 16, pl. 6.	.....	.....	*	Button-mould Knob, Allen co., Ky.	
9	" trapezoidalis	Sow.—Sil. Syst., pl. 5, fig. 14.	*	*	.....	Bear-Grass, Jefferson co.	Russia, Belgium, England, Spain.
10	" undulatus.....	Sow.—Min. Conch., Von Buch.	.....	.....	*	Button-mould Knob.	
11	" cuspidatus	Sow.—Phil. Pal. Foss., p. 72, pl. 29, fig. 124.	*	*	.....	Floyd co., Ia.	Russia. Russia.
12	" lynx	Eichw.—Russ. Geol., p. 126, pl. iii, fig. 3.	.....	.....	.....	Jefferson and Bullitt cos., Kentucky.	Russia.
13	Orthis Michelini.....	Leveille—vol. 1, p. 131, Russ. Geol., vol. 2, p. 185, pl. 13, f. 1.	.....	.....	*	Button-mould Knob, Bullitt co., Ky.	Belgium, Yorkshire.
14	" testudinaria.....	Dalm., vol. 1, p. 408.	*	.....	*	Jefferson county, Ky.	Russia.
15	" crenistria.....	Phil., vol. 1, p. 42.	.....	*	.....	Floyd county Ia.	Yorkshire, Russia.
16	Leptena depressa.....	Sow.—Min. Conch., Von Buch.	*	*	.....	Bullitt county, Ky.	Russia, Eng., Eifel.
17	" sericea.....	Sow.—Russ. Geol., vol. 2, p. 277, pl. 15, fig. 1.	.....	.....	.....	Bullitt county, Ky.	Russia, Gothland, Eifel.
18	Productus punctatus.....	Martini—Russ. Geol., vol. 2. p. 276, pl. 18, f. 3.	.....	.....	*	Button-mould Knob.	Russia, Belgium, England.

19	Productus semireticulatus.	Martini—Russ. Geol., vol. 2, p. 262, pl. 16, fig. 1.	.....	.....	*	Button mould Knob.	Russia, Belgium, England.
20	" subaculeatus ..	Murch. Sil. Syst.. Russ.,Geol. vol. 2, p. 282, pl. 16, fig. 9.	.....	*	.....	Clarke county, Indiana.	Belgium, France, Eifel, Russia.
21	Chonetes nana	Geol. Russ., vol. 2, p. 245, pl. 15, fig. 12.	.....	*	.....	Falls of Ohio, Bullitt co., Ky.	
22	" Dalmaniana....	De Koninck fossils de Belgique.	.....	.....	*	Button-mould Knob, Bullitt co., Ky.	Belgium.
23	Pentamerus oblongus	Sil. Syst., vol. 2, pl. 19, fig. 10.	*	.....	.....	Bear-Grass creek.	England.
	GASTEROPODA.						
24	Buccinum acutum.....	Sow.—Russ. Geol., vol. 1, p. 75, 440.	.....	.....	*	Button-mould Knob.	Yorkshire, Russia.
25	Loxonema Hennahiana ..	Phil. Pal. foss., pl. 38, fig. 184.	.....	*	.....	Falls of Ohio.	S. Devon, Plymouth.
26	Pileopsis tubifer.....		.....	*	.....	Falls of Ohio.	
	ACEPHALES.						
27	Lucina proavia	Goldf. p. 146, fig. 6.	.....	*	.....	Falls of O., Clarke co., In.	Eifel.
28	Venulites concentricus...	F. C. Roemer.	.....	*	.....	Clarke county, Indiana.	Eifel
29	Pleurorhynchus alæformis	Goldf., 146, fig. 6.	.....	*	.....	Falls of Ohio.	Eifel, Yorkshire.
	PTEROPODA.						
30	Conularia quadrisulcata..	Miller—Sil. Syst., p. 102.	.....	.....	*	Falls of Ohio, Button-mould Knob.	Brook Dale Coal.
	CRUSTACEA.						
31	Calymene bufo.....	Green Monag., Sil. Syst., pl. 14, fig. 2.	*	*	.....	Falls of Ohio, Clarke co, Indiana, New York.	Eifel, Yorkshire.
32	" Blumenbachii..	Brong., vol. 1, p. 401, Russ. Geol., vol. 1, p. 401.	*	.....	.....	Westport, Ky., Jefferson co., Ky, Bear-Grass.	Gothland, Russia.
33	Phillipsia Ouralica?.....	Russ. Geol., vol. 2, p. 378, pl. 27, fig. 16.	.....	.....	*	Button-mould Knob, Bullitt co., Ky.	Eifel, &c.
34	Griffithides sp.?		.....	.....	*	Button-mould Knob.	
	POLYPARIA.						
35	Favosites fibrosa.....	Goldf.—Sil. Syst., p. 682, pl. 15, fig. 6 and 7.	*	*	.....	Falls of Ohio, Columbus, O., New York.	Russia, Eifel.

A TABLE OF FOSSILS FOUND IN THE VICINITY OF LOUISVILLE IDENTICAL WITH EUROPEAN SPECIES.—CONTINUED.

Number of Species	GENERA AND SPECIES.	AUTHORS AND REFERENCES.	FORMATIONS IN EUROPE.			LOCALITIES.	PRINCIPAL LOCALITIES IN EUROPE.
			Silurian.	Devon.	Carbonif		
36	Favosites Gothlandica....	Lam.—Sil. Syst, p. 682, pl. 15, fig. 314	*	*	.....	Falls of O, Charlestown landing, Tenn, N. Y.	England, Russia, Eifel, &c.
37	" spongites.....	Goldf—Sil. Syst, p. 682, pl. 15, fig. 8 and 9.	*	*	.....	Falls of Ohio, Tennessee	England, Russia, Eifel, &c.
38	" polymorpha ...	Goldf.—Sil. Syst., p. 694, pl. 15, fig. 2.	*	*	.....	Falls of Ohio, Clarke co., Ia, New York.	Eifel, England, &c.
39	" basaltica	De Blainville—Sil. Syst., p. 682.	*	*	.....	Falls of Ohio.	Gothland, Eifel.
40	Sarcinula costata	Goldf—	*	.....	.....	Bear-Grass.	
41	Aulopora serpens.....	Goldf.—Sil. Syst, p. 675, pl. 15, fig. 5.	*	*	.....	Falls of Ohio, Perry co., Tenn.	Gothland Dudley, Eifel, &c
42	" tubaeformis....	Goldf.—Sil. Syst, p. 676, pl. 15, fig. 8.	*	*	.....	Falls of Ohio.	Wenlock, Eifel.
43	Catenipora escharoides...	Lam.—Sil. Syst., p. 685, pl. 15, fig. 4.	*	*?	.....	Bullitt co, Ky., N. York, Bear-grass.	Eifel (very rare), Gottland, Aymestery.
44	Cystiphyllum vesiculosum	Phil. pal. foss, pl. 4, fig. 12.	.....	*	.....	Falls of Ohio.	Eifel, South Devon.
45	Syringopora ramulosa....	Goldfuss.	.....	.....	*	Falls of Ohio, Floyd co, Ia.	Olne, Russia.
46	Retepora prisca	Goldfuss.	.....	*	.....	Falls of Ohio.	England.
47	Cyathoxonia cornu.....		.....	.....	*	Button-mould Knob.	
48	Stromatopora polymorpha	Goldf., pl. 8, fig. 5, Sil. Syst, pl 15, fig. 31.	*	*	.....	Bear-Grass, Falls of Ohio.	Wenlock, Dudley.
49	Lithostrotion floriforme...	Flemming.	.....	.....	*	Floyd co., Ia; Hardin co, Ky.	England.
	CRINOIDEA.						
50	Cyathocrinus geometricus	Goldf, pl. 8, fig. 5, Phil. pal. foss p. 60, fig. 41.	.....	*	.....	Button-mould Knob.	Newtown, Eifel.

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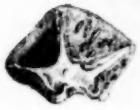

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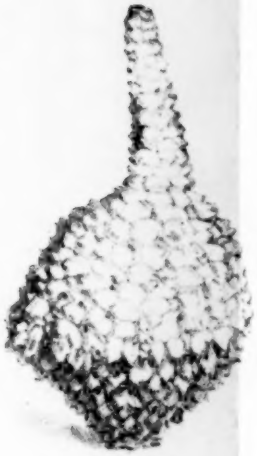

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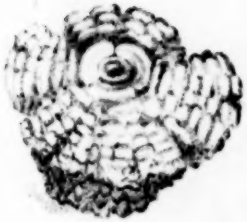

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A TABLE OF FOSSILS FOUND IN THE VICINITY OF LOUISVILLE IDENTICAL WITH EUROPEAN SPECIES.—CONTINUED.

Number of Species	GENERA AND SPECIES.	AUTHORS AND REFERENCES.	FORMATIONS IN EUROPE.			LOCALITIES.	PRINCIPAL LOCALITIES IN EUROPE.
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37	" spongites.....	Goldf—Sil. Syst, p 682, pl. 15, fig. 8 and 9.	*	*	.....	Falls of Ohio, Tennessee	England, Russia, Eifel, &c.
38	" polymorpha ...	Goldf—Sil. Syst., p. 694, pl. 15, fig. 2.	*	*	.....	Falls of Ohio, Clarke co., Ia, New York.	Eifel, England, &c.
39	" basaltica	De Blainville—Sil. Syst., p. 682.	*	*	.....	Falls of Ohio.	Gothland, Eifel.
40	Sarcinula costata	Goldf—	*	.....	.....	Bear-Grass.	
41	Aulopora serpens.....	Goldf.—Sil. Syst, p. 675, pl. 15, fig. 5.	*	*	.....	Falls of Ohio, Perry co., Tenn.	Gothland Dudley, Eifel, &c
42	" tubaeformis....	Goldf.—Sil. Syst, p. 676, pl. 15, fig. 8.	*	*	.....	Falls of Ohio.	Wenlock, Eifel.
43	Catenipora escharoides...	Lam.—Sil. Syst., p. 685, pl. 15,	*	*?		Bullitt co., Ky., N. York	Wenlock, Eifel.

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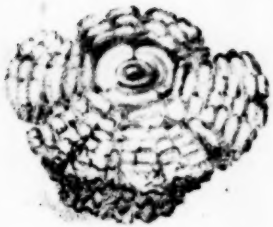

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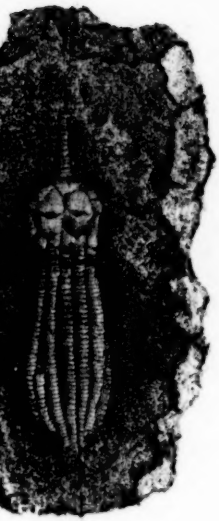

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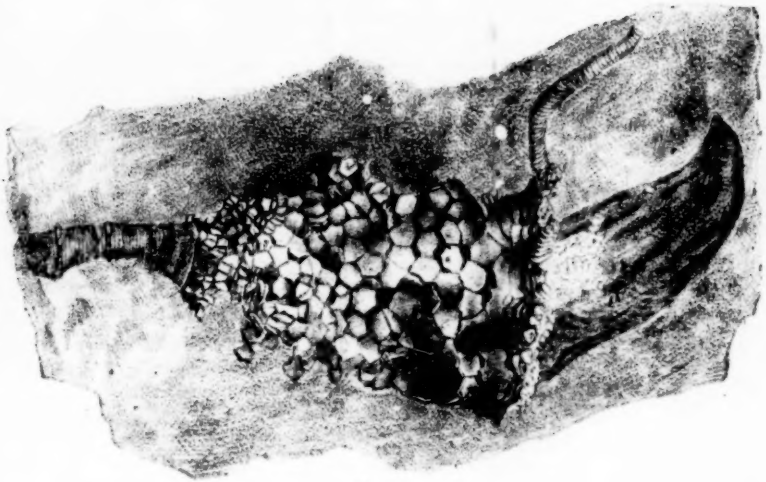

3.

SELECTIONS

FROM

AMERICAN AND FOREIGN JOURNALS.

Removal of a large Scirrhous Testicle from a Man while under the Influence of Nitrous Oxide Gas. By E. E. Marcy, M.D., of Hartford, Conn.—The subject of the operation was a young man, 24 years of age. He had been afflicted with an enlargement of the testicle for about a year past. Within the last few weeks the disease progressed so rapidly that the lower portion of the gland and scrotum became gangrenous and sloughed. The case was highly unfavorable in every respect, yet believing extirpation to be the only means which could save the man's life, the operation was performed on the 17th of August, the protoxide of nitrogen having been previously administered by Dr. Wells, the discoverer. The patient commenced inhaling the gas at half past 1 o'clock, P.M., and after about one minute from this time the operation was commenced. At the first incision there was a slight manifestation of pain (the full effect of the gas not having yet been received), but from this instant until the diseased mass was removed, and all the bloodvessels secured (there being quite a number which required ligatures), there was not the slightest consciousness of pain on the part of the patient. We were satisfied that this was the fact during the operation, from the placid and happy expression of his countenance, from the entire absence of all muscular efforts, and from the natural and unexcited state of the pulse (this having remained without any apparent variation during the whole period). The operation was necessarily tedious and protracted on account of the great size of the gland, the ex-

tensive and firm adhesions of the integuments to the diseased structure, and the unnatural enlargement of several arteries which required ligature. The whole period consumed, from the commencement of the operation until the vessels were secured, was not far from fifteen minutes. On questioning the patient afterwards, he asserted that he experienced a *slight* painful sensation at the commencement of the first incision, but from that time until the dressings were applied he was entirely unconscious of any pain!

After the operation, he expressed himself as feeling perfectly well, except some smarting in the wound; no pain or other unpleasant feeling in the head or any other part of the body; pulse regular and natural, as before the operation.

August 18th. Since the operation, the patient has suffered no pain or other unpleasant symptoms. Pulse 82, and moderately firm. Expresses a strong affection for the gas-bag, and an earnest desire to retain it in his possession as the grand balm for the pains and troubles of this life.

The above case affords additional testimony (if this was required) that the nitrous oxide is capable of banishing sensibility in the most severe operations, and that, too, without exposing the patient to any of the untoward effects which result from the use of ether. The latter article exerts a more deleterious effect upon the nervous system than the former, as is indicated by the pain in the head, lassitude, &c., which follow its use. Another still more important objection to the use of ether, arises from its injurious effect upon the blood. It has been found by experiment that the arterial blood becomes highly charged with carbon after the inhalation. The effect of this upon the system must be very injurious; for unless the due proportion of oxygen be retained in the arterial blood, diminished nervous force and vital energy, with other states which *at least* predispose to disease, must be induced.

The above objection will not hold good in relation to the nitrous oxide, as its constituents are the same as common air with an increased proportion of oxygen; while the ether bears no analogy to the air, and will therefore be more prone to give rise to injurious consequences. The effect of ether upon the circulatory vessels is in the first instance extremely violent, succeeded by an alarming state of depression in their action. The effect of the gas is much milder upon these vessels, and never need be carried to such an extent as to be followed by any depression.

When Dr. Wells made the great discovery, in 1844, that the inhalation of nitrous oxide gas would render the body entirely insensible to the pain of surgical operations, the question suggested itself to me, as well as some others, of this city, whether sulphuric ether might not answer as good a purpose as the gas. This subject was fully discussed at the time by a number of professional men here, and a trial made with the ether; but the general opinion was then formed, that the nitrous oxide was on many accounts preferable. Numerous trials with both these substances, from that period to the present time, have demonstrated conclusively that this opinion was correct.

I am informed by Dr. J. M. Riggs, of this city, that he has used the gas constantly since November, 1844, and with uniform success. He has performed more than one hundred dental operations on patients while under its influence, and with more uniform success than has resulted from the use of the ether.

Dr. Wells has used the gas in only about fifty instances, on account of his relinquishing his professional business for a time. We are assured by both these gentlemen, that in no instance have they been troubled by muscular efforts on the part of their patients. Indeed, it may be asserted with safety, that so far as muscular action is concerned, it possesses a decided advantage over the ether. We are aware that it has been impudently asserted by certain interested persons, who have never given the protoxide a trial in an operation, that the patient will become "dancing mad," &c., &c. But facts prove this to be far from the truth. So far, then, the gas is preferable to the ether.

Another superiority which it possesses over the ether, is that its after-effects are far less unpleasant—less headache, less lassitude, and less depression of the nervous system, always resulting from its use. Ether generally causes troublesome choking and cough; the gas scarcely ever. Ether is objectionable on account of the unpleasant smell which it communicates to the room; the gas possesses no disagreeable odor. Ether abstracts largely from the oxygen of the arterial blood, thus becoming a direct source of disease; the gas has no such effect. Ether gives rise to pains in the head, lassitude, impaired vital energy, and other symptoms indicating serious depression of the nervous system; the gas rarely produces any of these effects, and if *ever*, only in a slight degree. In order to produce the full effect of the ether, it is

customary to reduce the patient to a state of stupor; the gas is capable of rendering the body entirely insensible to the pain of the most severe surgical operation, without putting the patient to sleep, or causing any stupor! We have often observed patients watch the progress of severe operations upon their own persons, with countenances as smiling and happy as if they were enjoying a delightful treat.

We firmly believe that the gas would have long since entirely superseded the use of the ether, had it not been for the trouble attending its preparation. We trust, however, that in future this slight inconvenience will not prevent the surgeon, who has the welfare of his patient at heart, from making use of the agent so manifestly superior in its effects.

The State Legislature of Connecticut, which has just closed its session, has, after a due consideration of the evidences, fully recognized Dr. Horace Wells, of Hartford, as the sole discoverer, and have passed him a vote of thanks for this great discovery, which consists, as the vote expresses it, in the use of "nitrous oxide gas or ether in surgical operations." Thus the question of priority is finally settled by legislative enactment.—*Boston Med. and Surg. Jour.*

Successful Surgical Operation.—A paper in New Hampshire states that an eminent physician of Manchester recently opened the stomach of a patient, and removed several hard substances which had completely obstructed the passage from it. The patient is doing well, and will undoubtedly recover. The operation was performed in the presence of several gentlemen, and occupied from ten to fifteen minutes. A more full report will doubtless be made of this operation, if, indeed, it turns out that there was anything remarkable in it.—*Ibid.*

Poisoning by the Arsenite of Copper.—A child of Mr. Andrew Howe, of Townsend, Mass., was poisoned recently with a green card, which was given to it for a plaything. The fluids of the child's mouth dissolved the green pigment, which it swallowed, producing the most alarming symptoms.

Antidotes and remedies were promptly and perseveringly applied by the attending physician, Dr. Hitchcock, of Ashby. The child is now well. Dr. Hitchcock ascertained that the green paint which ornamented the card, was composed of Scheele's green (arsenite of copper) and carbonate of lead, two most virulent poisons.—*Ibid.*

On the Use of Eupatorium Perfoliatum, Thoroughwort, Boneset. By T. T. Lockwood, M.D.—Eupatorium is a Tonic, Diaphoretic, Expectorant, Emetic, and Aperient. The herb derived its name of boneset from its prompt manner of relieving pains in the limbs and muscular system.

In the following diseases I have found the boneset peculiarly valuable:—Influenza, Catarrh, Bronchitis, Chronic hepatitis, Dyspepsia, Chlorosis, Intermittent Fever, Anorexia consequent on drunkenness, Sub-acute and chronic rheumatic affections.

Influenza.—In this disease generally we have to encounter pain in the fore part of the head, sometimes extending down to the cheek bone, pain in the back and limbs, with feelings of lassitude, and universal prostration, harrassing cough, dyspepsia, pulse feeble and vacillating. One peculiarity of influenza is, that the cutaneous surface generally exhales a morbid perspiration, resulting apparently from a passive state of the skin.

When the attack of influenza is unusually severe, accompanied with a bilious derangement of the stomach and bowels, it is generally best to precede its employment by a mercurial cathartic. The boneset is pecliarly applicable to the treatment of this disease as it occurs in old people.

In the treatment of *chronic hepatitis* with the thoroughwort, the mode of administering it should be varied. Every third or fourth day, the warm infusion should be given to the extent of inducing slight emesis, and during the intermediate days a moderate use should be made of the cold and warm infusions alternately.

In *Intermittent fever* it will not do to rely upon the Eupatorium alone. My experience in the treatment of the latter complaint with this remedy has been pretty extensive, and I am fully satisfied that it has no specific influence over the paroxysms, and should only be looked upon in the light of an auxiliary.

In *Anorexia* consequent on drunkenness, the boneset, from its combination of properties, is a useful remedy. It restores the tone and action of the stomach, and acts as a slight stimulant to the biliary organs. In the last complaint, the cold infusion is generally indicated.

It does not seem to increase the force and frequency of the heart and arteries, but holds a middle rank between the relaxing and accumulating diaphoretics.

A small quantity of the cold infusion of boneset can be used in the latter stages of typhoid or typhus fevers with marked good effect. It preserves the action of the stomach and bowels.

Manner of Administration.—When we give the boneset with a view to its diaphoretic or emetic effect, the patient, after being covered in bed, should be induced to drink a wine glassfull of the warm infusion every half hour. After the fourth or fifth dose, considerable nausea, with free diaphoresis ensues; should vomiting be desired give the patient one or two doses more.

Preparation.—One and a half ounce of the dried leaves in one pint of boiling water.

In most of the diseases in which I have recommended the boneset, bloodletting is of little avail. The latter seems to have scarcely any control over bronchitis, influenza or catarrh. It weakens the patient without making a decided impression upon the disease, and, to say the least, it is of doubtful propriety.

I do not recommend the boneset as a panacea, but consider it a valuable indigenous herb, one that is too much neglected by the regular profession. It should be collected about the tenth of August.—*Buffalo Medical Journal.*

Alum in Pertussis.—Dr. Davies thus speaks of the employment of alum in pertussis:—

After a long trial, I am disposed to attach more importance to alum as a remedy in hooping-cough, than to any other form of tonic or antispasmodic. I have often been surprised at the speed with which it arrests the severe spasmodic fits of coughing; it seems equally applicable to all ages, and almost all conditions of the patient. I was form-

erly in the habit of taking much pains to select a certain period of the illness for its administration, and waiting until the cough had existed at least three weeks, taking care that the bowels were open, the patient free from fever, the air-passages perfectly moist, and the disorder free from complication of any bruit. A continued observation of the remedy, however, has induced me to be less cautious, and I am disposed to think that a very large amount of collateral annoyances will subside under its use. The fittest state for its administration will be a moist condition of the air-passages, and freedom from congestion, but an opposite condition would not preclude its use, should this state not have yielded to other remedies. It generally keeps the bowels in proper order, no aperient being required during its use.

The dose for an infant is two grains daily; and to older children, four, five, and up to ten or twelve grains may be given, mixed with syrupus rhœados (syrup of red poppy) and water. It is seldom disliked.—*Underwood's Diseases of Infants.*

Observations on the term of Utero-gestation in man and inferior animals, &c. By T. T. Lockwood, M. D.—The following statistics, which have been collected with accuracy, may possess interest for some readers. My attention having been directed to the subject by a little incident occurring in my neighborhood, I was led to consult authorities on the term of utero-gestation, and I found not a little discrepancy of opinion. I then commenced keeping a note book of the term in some of the domestic animals, and the following results, relating to the Cow, are submitted:

In six hundred and twenty-one Cows, fifty calved between two hundred and sixty and two hundred and seventy days; five hundred and fifty-six, between two hundred and seventy and two hundred and eighty days; fourteen between two hundred and eighty and two hundred and eighty-six; one, only, went two hundred and ninety days.

Five hundred and fifty of the cows were observed to have the mucous discharge, more or less, for twenty-four hours previous to calving. All that were noticed seemed to be very restless for twelve or fourteen hours previous, and when labor came on seemed to have regular pains.

Most of those that calved short of two hundred and seventy days, were heifers with their first calves; and all of them

that went over two hundred and eighty days, were old cows with large abdomens.

The conclusion from these observations is, that a cow seven years old, and well built, will most probably go two hundred and seventy-six days.

The following experiments were made to ascertain the importance of the condition of *heat* in the same animal:—A two year old heifer was subjected to involuntary intercourse twice, and kept separate for the rest of the year. Conception did not follow. This experiment was tried in three instances with the same result.

The actual duration of the term of gestation in the human subject was ascertained in the following cases:—

——, aged 19, duration 272 days, first confinement. ——, aged 30, first confinement, duration 276 days. ——, aged 17, duration 270 days. ——, aged 44, seventh confinement, duration 284 days, the child weighing fourteen pounds.—*Buffalo Med. Journal.*

A Pleasant Substitute for Epsom Salts as a purgative.—M. Garot recommends the following formula for the preparation of tasteless purgative salts (citrate of magnesia):

Carbonate of magnesia, - - -	15 parts.
Citric acid, - - - - -	21 to 22 "
Aromatic syrup, - - - - -	60 "
Water, - - - - - - -	300 "

The citric acid is separately dissolved and added to the carbonate of magnesia diffused in water.

As thus prepared it is not effervescing, but it is easily rendered so by adding only half the quantity of acid, and reserving the addition of the other half until the dose is taken. The above proportions in grains would constitute a dose.

Dr. Pereira long since suggested the use of citrate of magnesia in nearly similar proportions. He found that one scruple of crystalized citric acid saturated about fourteen grains of light or heavy carbonate of magnesia.—*Lond. Med. Gaz.*

THE WESTERN JOURNAL.

NEW SERIES.—VOL. VIII.—NO. IV.

LOUISVILLE, OCTOBER 1, 1847.

TRAVELING LETTERS FROM THE SENIOR EDITOR.

NUMBER THREE.

Chautauque Lake, N. Y.,
August 1st, 1847.

To My Colleagues:

GENTLEMEN:—The beautiful miniature lake, on the banks of which I am now writing, is 1291 feet above the sea, and 700 feet above the average level of the "great lakes," from Erie to Superior,—thus defect in area, is compensated by loftier elevation. For several years there was on this mountain water, a steamboat which made daily trips between Jamestown and Mayville, at its opposite extremities; and, full of "human nature," I promised myself a voyage on the highest level which has yet been navigated by steam in our own or any other country, but on arriving, I found the little steamer with her fires extinguished, because of deficient patronage. We, who love to claim for our beloved Ohio all that justice will permit, and perhaps a little more, may write down and publish, that Chautauque lake, although within 80 miles of the Falls of Niagara, prefers the "sunny south," and pours its superfluous waters into the Allegheny. This it does by sending them through the obsolete bed of another lake of similar size, which has been permanently drained into that river at the beautiful mountain village of Warren, in the State of Pennsylvania, where my last letter was written.

The gently rolling table land around the lake is about two or three

hundred feet above its surface, and being fertile, well timbered, and abounding in springs, is thickly inhabited; and thus presents the best opportunities for studying the influence of altitude on health, that are, at present, to be found in the central valley of North America. In fact, if we divide the population of the valley into fifteen parts, we shall, I think, find that five live on or below the level of five hundred feet; eight within the next zone of five hundred feet; leaving not more than two for the zone from a thousand to fifteen hundred feet, the summit level of the south-west corner of the State of New York, where I now am. As we advance from south to north we know that some diseases diminish in frequency and violence, or cease altogether; while others increase in prevalence or appear for the first time. Now, is the law of higher elevation coincident with that of higher latitude in these respects? I shall not at present discuss this question of Medical Geography, for the elucidation of which I have collected several facts, but hope that some of our correspondents will favor us with their observations.

The table land, which stretches east and west from Chautauque lake, has a definite geological character. Immediately to the south, is the final out-crop of the conglomerate, which underlies the great coal formation, that extends along the western flanks of the Allegheny mountains to Alabama. Every where this conglomerate gives us high and rugged acuminate or conical hills; and every where the Devonian Sandstone and Shale, which succeed to it, present soft and gentle aspects. It is this formation which constitutes the Chautauque platform. Entirely destitute of calcareous beds, all the water would be soft, but for the great deposit of *drift*, which is not only accumulated in terraces in all these elevated valleys, but overspreads the highest ridges. Thus, at the altitude of 1600 feet, or twice the average elevation of Kentucky and Indiana, we find sand, rolled pebbles, boulders, and immense blocks, such as everywhere abound at a lower level north of the Ohio, but are no where found south of that stream. When examined, this *debris* is found to have been brought from the north; and, as to the erratic masses of granite and other primitive rocks, they are supposed by the New York geologists—or at least by Mr. Hall—to have been transported from the Adirondack mountains, west of Lake Champlain, which are more than three times as high as this table land, and were consequently two thousand feet above the level of the sea, when it was a thousand feet beneath the surface. In the valley of the Allegheny river, at Pittsburgh, and wherever I traveled in it, up to this place, I met with *drift*, but in no portion of the route, was it so abundant as in the bed of the dried up lake, through which Chautauque discharges its superabundant waters. This ancient valley, from one to four miles in width, enters that of the Allegheny by a broad opening which abounds in terraces of *drift*. Hence, it was one of the gateways, through which the traveling fragments were rolled into that valley, and

cast upon the flanks of its rugged hills. A word more on this subject and I will "let you off." If the mountains of New York sent over the west huge masses of their rocky strata, it may be asked why the mountains of Virginia and North Carolina did not overspread Kentucky and Tennessee with similar blocks? Meteorology, I presume, can give a correct reply. The Adirondacks are found in the latitude of 44°—the high mountains of the south lie in 35° or 36°. The cold of the former might be sufficient to produce glaciers—that of the latter insufficient; and hence we derive an additional argument in support of the theory, which ascribes the transportation of erratic blocks to floating icebergs. I am bound, however, to mention an objection to this theory, which, I believe, has not yet been published, viz:—that these masses of rock are no *colder* than any other stones; and this reminds me of a kindred objection, by another person, to a palæontological conclusion:—Having found a *Favosite* in fresh plowed ground, he declared it was not, as the geologists believe, a product of the sea, but a petrified bee's comb for he could smell the honey!

GENESEO, N. Y., August 5th, 1847.

On leaving Chautauque Lake, and passing from the county of that name, my way was to the north-east. In the adjoining counties of Cattaraugus and Allegheny, I traversed, within a few hours, streams which fall into the Allegheny river, Lake Erie, and Lake Ontario, coming very near to others which flow into the Susquehanna. Thus I passed through a hydrographical axis, from which different parts of the same thunder shower flow to the Atlantic Ocean by the Gulf of Mexico, the Gulf of St. Lawrence and Chesapeake Bay, through 20° of latitude, and 30° of longitude. Verily, our hydrography is like our Anglo-Saxon self-complacency, on a large scale. Having traversed this centre, I came fairly into the basin of Lake Ontario, and made a somewhat rapid descent into the celebrated Genesee flats. These flats are nothing more nor less than the bottom of a drained lake, through which the Genesee river, about the size of "Salt River" (to which I refer on account of its notoriety), flows into Lake Ontario. The Genesee does not enter at the head of the old lacustrine valley, but on its western side; coming down from the Chautauque summit level, like a true mountain stream, by a series of remarkable cataracts, but flowing afterwards with a sluggish current. The town in which I am writing, is seated on the eastern bank of the valley, about seven miles below the influx of the river. For many years after the commencement of settlement, this valley, one of the most fertile in the United States, and from two to five miles wide, was infested with autumnal fever, some cases of which were as malignant as any we still meet with 10° further south. Cultivation, however,

has nearly eradicated their cause, notwithstanding many portions are liable to annual inundation. Such, in reference to intermittent and remittent fever, is the favoring influence of a colder climate. It is worthy of notice that this valley, especially the part near which I am writing, was formerly inhabited by the Senecas and other tribes of the Iroquois Confederacy. Now as the Indian is by no means exempt from autumnal fever when exposed to its cause, we may infer that the disease did not prevail while the flats were covered with forest; but when they were denuded of trees, and the soil was broken up, that fever was for a time extremely prevalent.

I find in this locality a great deal of goitre, and have been told of two or three congenital cases.

The formation is Devonian shale, which crops from beneath the sandstone of the Chautauque summit level. This shale is the equivalent of that which has a line of bearing across the State of Ohio, from the mouth of the Sciota to that of the Cayuhoga. In the whole of that zone goitre prevails; and although I have met with it under different geological circumstances, I have certainly seen more of it in connexion with that formation than any other.

Speaking of geological formations leads me to speak of Geological Reports of which I have this evening made a purchase, designed for the Library of our University, if the committee of augmentation see fit to take them. They are the Reports of the Geologists, Mineralogists, Botanists, and Zoologists of the State of New York, in thirteen quarto volumes, with a separate geological map, and the *prëemption right* to two unpublished volumes—one on Agriculture, and the other on Palæontology. This work, it is said, has cost more than $400,000! What a noble example! How deserving of imitation by all the States of the Union which have not yet undertaken such an enterprize! Truly this *is* the Empire State: and yet I am sorry to be obliged to add, that imperial Republics, like Emperors themselves, may do very little as well as very great things. A short time since, it seems, the members of the legislature undertook to present themselves with copies of this magnificent work, for which, by the way, the world was indebted not to *them*, but their predecessors; but a constitutional obstacle was thrown in their path. It was, however, soon surmounted by the happy thought of selling off the work at the nominal price of a dollar a volume! The law provided, that copies should be presented to certain county academies, but passed by the colleges of the State generally, and directed that the remainder should be sent to the treasurers of the different counties, in numbers proportionate to their population, there to be sold to those who should first hand in their names. The consequence was, that a large portion of the whole edition fell into the hands of persons who cannot read them.

while hundreds of scientific men and institutions, are left without any, or can only obtain them at an immense advance on the price given by speculators. Thus I was obliged to pay $50 for what the man of whom I purchased had paid only $13 the day before.

AVON SPRINGS, August 6th.

This is the land of buggies as well as of humbuggies. Having yesterday submitted myself to one of the latter, I this morning committed myself to one of the former, and left Geneseo to spend a few hours at this watering place, and be ready for the afternoon stage to Rochester. The village of Avon, like the other villages of New York, *abounds* in white frame houses, built in good taste, and delightfully embowered in trees and flowering shrubs. The Springs boil up at the margin of the flats, and one of them is so copious, as to turn a small overshot wheel, which works a pump, whereby a quantity of the water is raised fifteen or twenty feet to form shower-baths. Such is the labor saving ingenuity of our brethren in this northern section of the Great Central Valley. The water is likewise heated in close boilers, so that invalids may have baths of every temperature, from 48° to any higher point, according to their tastes or necessities. Stately and overshadowing elms, with comfortable pavilions, are at hand, and altogether, the place has a fine appearance of comfort. But I must come to the springs themselves. They are three or four in number, and vary somewhat in their composition and effects; which are pointed out in a well written pamphlet, by Dr. Salisbury, an intelligent and and respectable physician of the village, a copy of which has just been given me. The chief gaseous ingredients are sulphuretted hydrogen and carbonic acid; but some of the fountains also contain nitrogen gas. The active saline elements are the sulphates of soda and magnesia, and the muriates of soda and lime. The sulphate and carbonate of lime are also present, though perhaps comparatively inert. The analyses were made by Professor Beck, Professor Hadley, and Dr. Chilton, of the city of New York. Waters of such a chemical constitution cannot fail to be medicinal. According to Dr. Salisbury who has observed their effects for twelve or fifteen years, they are decidedly curative, in the following maladies:—1st. Almost all chronic diseases of the skin. 2d. Torpor of the liver and dyspeptic derangements of the stomach, with constipation. 3d. Chronic inflammations of the urinary organs 4th. Chronic bronchitis. 5th. Chronic rheumatism.

Now you may ask, of what use is this account of a watering place, in the Genesee flats, to the readers of the Journal down in the south-west? I answer, a great deal. The south-west, as far as I know, can boast of no better springs; and invalids need distant excursions, a northern climate, and interesting scenes and objects. All these they will have by making

their way to the lakes and traversing Erie to the Falls of Niagara, from whence in a single day, if they choose, they may, without fatigue, seat themselves under the quiet and wide-spreading elms of Avon, in as high a lititude as Saratoga. They will here meet chiefly with invalids, and be free from the annoyance of those frivolous and fashionable people, who visit more noted watering places for the purpose of displaying their accomplishments, and entrapping each other into matrimony.

ROCHESTER, August 9th.

From Avon to this place, the distance is twenty miles, and may be traveled either by land or water, which I mention for the edification of invalids. In passing from Geneseo to Rochester—from south to north—we traverse in its shortest diameter, the zone, which Dr. Emmons, in his Report on Geology applied to Agriculture, calls the Wheat District of New York. He thinks, I believe, that something in the soil, gives to the wheat grown upon this belt, a better quality than that raised elsewhere. Certain it is that the Genesee flour maintains a very high reputation.

In descending from the hill country to this place, through a thousand feet, I have found that the lower level has much more than compensated for the higher latitude. Peaches are successfully cultivated here; while a degree further south, on the Chautauque platform, they are entirely neglected. When I was there, many fields of Indian corn were materially injured by the frost, while, in the flats, they escaped, and are, moreover, much further developed. Finally, those men who swing the scythe and cradle as a profession, after having cut the harvests below, were ascending to the south for the same object.

Rochester, with its 30,000 inhabitants, is the wonder of this region, as Cincinnati and St. Louis are of the west. Its remarkable growth is to be ascribed chiefly to the Falls of the Genesee river, the waters of which in finding the level of Lake Ontario descend, within the limits of the town, 260 feet!

It is a sort of popular opinion, both in and out of the profession, that rivers which flow through alluvial grounds absorb miasms which they give out under the agitation of rapids or cataracts. The Genesee flows for forty or fifty miles in such a bed, but miasmatic fevers are rare at Rochester in latter years, while they still prevail along the great waters of the estuary below, quite down to the Lake, the shores of which are swampy. It is a current belief, at this as in many other towns, that as autumnal fever has diminished, consumption has increased. However this may be, that fatal malady does its work most unrelentingly here, for in 1845, of 364 deaths, 77, or more than a fifth, were from that disease.

Rochester has a public cemetery called Mount Hope, which does equal honor to her taste and moral feeling. The site is a portion of the clay and gravel hills which, south of the town, range parallel to the lake, and were heaped up by its waves when they once occupied a much higher level than at present. The inequalities of surface are truly remarkable, presenting ridges, winding valleys, high mounds and funnel-shaped depressions of great depth. Nearly the whole is covered with native forest trees and shrubs, with which exotic flowers, both perennial and annual, bloom in striking contrast. The deep and dark pits are terraced to the very bottom, and converted into sepulchral craters, which in the dim light of the evening sun display white monuments that stand like guardian angels over the remains of the dead. From the highest eminence the blue line of Lake Ontario appears in the distance, while from other parts the Genesee river is seen like a moat protecting the consecrated grounds from intrusion. Paths and carriage roads conforming to all inequalities of surface carry the visitor through every part, and often startle him with the unexpected sight of marble obelisks, which in purity of appearance might pass for emblems of those who had "washed their robes and made them white in the blood of the Lamb." This beautiful and solemn burial place belongs to the city, which conveys small portions of it by deed in fee simple to families, but retains jurisdiction over the whole, and protects every work of art and every flower, down to the humblest blue violet, by adequate penalties and a vigilant police. Finally, a portion is reserved as a "Potter's Field," and it is interesting to see with what pains the poor in many cases have sought to decorate the graves of friends, which under other regulations would be left to sink beneath the surface and be seen no more.

Now, I hope you will not strike this hasty paragraph from my letter as of no interest to our readers. If they should not be interested in it, they ought to be; for there is no class of men who could do more to promote the establishment of such cemeteries, and certainly their refining, moral influence is imperatively needed, seeing how small is our veneration for the monuments and memory of the dead.

I had hoped to include in one letter all that I might wish to say of New York, but find I cannot without tiring out both our readers and yourselves. I shall therefore subscribe myself

Your obedient servant,

D.

TRAVELING LETTERS FROM THE SENIOR EDITOR.

NUMBER FOUR.

GROS ISLE, 33 miles below Quebec, August 27.

To my Colleagues:

GENTLEMEN: Since I left Rochester, where my last was finished, I have seen and heard many things miscellaneous which I might embody in a letter; but presuming that our readers have been sufficiently dosed with them, and finding myself in the midst of an epidemic which strikingly sustains the old and universal association of words—famine and pestilence—I propose to let the past remain where it is, and devote myself to the present.

Quebec is the terminating point of steampacket navigation on the Saint Lawrence, but the Canadian government has procured the running, twice a week, of a small steamer from that city to the quarantine station. It is owned and directed by Mr. W. Stevenson, a respectable merchant of the city, who, hearing of my desire to go down, politely offered me every facility. I am now on board about to return, as the boat will start as soon as the convalescents whom I see standing on the dock have been taken on board. On my way up, and afterwards, I propose to give our readers a rapid and superficial sketch of what I have seen here, and what I may hereafter see in Quebec and Montreal, though, as I have not seen our Journal for the last two months, I do not know but that you have already published enough on the subject.

Gros Isle is one of the endless succession of beautiful islands which adorn this noble river from Lake Ontario to the Gulf of St. Lawrence. Many of them consist of ancient *drift*, and have level surfaces which rise but a few feet above the water: but this is rocky and rugged, with heights of eighty or a hundred feet in its center, and hence the name given it by the early French voyageurs. Its breadth is less than a mile, with a length of nearly two. The black birch, white cedar and various kinds of pine overshadow and partly obscure its stony surface.

The quarantine station is on the southeast or right hand side, which in the approach presents three distinct groups of one-story board sheds, some of which are mere cottages, but others are from two to four hundred feet long. The lowest or eastern group is for the reception and temporary accommodation of immigrants in health; the next up the island is for the quarantine physician and a small detachment of troops from the garrison at Quebec: the third or western, more extensive than both the others, for the sick and their physicians, nurses, and a numerous body of carpenters engaged in the erection of additional houses to receive the hundreds who are still lodged in tents and marquees. The buildings of each group are

whitewashed, and appear in pleasant contrast with the green slopes and tuberosities of the island in their rear. The harbor in front presents several ships at anchor, and two or three steamboats, with a neat and nearly finished dock projecting to a distance into the stream. When we were near the harbor, a gentleman, Mr. Patten, who resides in its neighborhood, and who had kindly directed my attention to different objects on our little voyage, called my eye to an Irish immigrant ship then passing us. On inspecting the group of passengers with a glass, I was surprised to find them so healthy in appearance; and when about to express myself to that effect, he discovered and announced that it was a ship from Bremen. Such is the difference between the German and Irish immigrants in health and personal condition.

A distant view of Gros Isle suggests a new and busy colony on a romantic shore, but a walk up the dock which leads directly to the hospital sheds most painfully dispels the pleasing illusion. As I approached them, the emaciated forms and haggard faces of convalescents—sauntering about, or crouched on the ground and rocks, or sitting underneath the eaves and on the piles of boards to be used for coffins—impressively told what might be expected within. Conducted by Mr. Patten, I passed through them without stopping till we reached the quarters of Dr. George M. Douglas, the health officer, who received me with much hospitality. I found him lame from a kind of hospital gangrene or slough which had attacked one of his feet, but, intent on his duties, he was bravely hopping about and answering a hundred questions or giving as many orders.

Taking me in his buggy, he drove to his office in the midst of the sick, where I was introduced to several of his assistants. They are chiefly young physicians of Quebec and other towns of Canada, employed by the government. One to whom I was introduced, although walking about, labored under fever, and yesterday I saw another at Quebec who had returned in the same condition. The number of assistants today is nine. Since the first of June, twenty-one or twenty-two have been employed. All except Dr. Douglas have experienced attacks of the fever, and three have died, one of whom was Dr. Frederick Cushing, formerly of the State of Maine. The exemption of Dr. Douglas is to be ascribed to his having already had the disease. After conversing awhile on its symptoms and treatment, Dr. Watt and Dr. Fenwick conducted me to their respective hospitals, embracing six or eight hundred patients, where I took such a *coup d'œil* of the sick as my limited time would permit, examining with some attention a considerable number in every stage of the disease. From a necessity which the Canadian government up to this time has been unable to avert, all the tents and sheds are crowded to such a degree that one can scarcely turn round among the sick. Men, women and children in all stages of the disease up to dissolution are huddled together, and lying in

the same foul and infectious clothes with which they started from Ireland, and which no doubt they had worn without change for weeks or months before. The quarantine officers must not be blamed for this, since the means of classification and personal cleanliness are not within their reach. As to nursing, it is evidently in the lowest degree. Nearly all the nurses from Quebec have sickened, and the immigrants furnish but few from their own body. Their sympathies for each other are manifestly small—either never had an existence or have perished under the combined influence of famine and filth. Examples of the well members of a family refusing to wait on the sick are familiar to all the medical gentlemen, and a total indifference to the death of nearest relatives is witnessed every day. Following their remains to the grave, or in any manner assisting in their interment, is not thought of. But one idea seems to be present with them, that of getting up the river. A man who had recovered, on being asked by some one whether he was going to Montreal in the next steamboat, replied that he wished to do so, but was afraid his wife would not die in time. The family of a young woman who was ill *sent* to know how she was before they started; on being expostulated with, they said it was not worth while to stay any longer, as she would no doubt die. Mr. Barton, the apothecary of the hospital, who is now by my side going to Quebec on official business, confirms all that has been told me by others, and adds, as the result of his own observation throughout the summer, that the living seem more pleased than grieved by the death of their friends. My own limited opportunities suggest the same unwelcome conclusion; for I saw no aspect of sorrow, but a stolid indifference or inquisitive gazing at what might be passing around, both in the crowds of convalescents and in patients not very ill, who lay in the midst of the dying. It is painful to record this testimony against human nature, but we ought to know to what depths of degradation large masses of people may be sunk by superstition, ignorance, bad legislation, famine and fever. The interests of political economy, religion and medicine are equally involved in the contemplation of such revolting facts.

QUEBEC, August 28.

Before and since my trip to Gros Isle, I have visited the marine hospital of this city, (under the care of some of its most respectable physicians,) where a great number of seamen are down with the fever, and near which there are extensive sheds filled with sick immigrants. I have also been at the house of correction and in the Hôtel Dieu, where I saw cases, and at the private hospital of Dr. James ouglas and Dr. Racey, in Beauport, a village three miles from the city, where I saw still more. Many of the cases I examined with care, and held conversations more or less protracted with a number of the medical attendants, among whom I may mention

Dr. Morrin, Dr. Racey, Dr. J. Douglas, Dr. Clark, and Dr. Fremont, whom I may unite with the physicians of Gros Isle as the authors of what I am about to say on the history and treatment of the fever.

1. The pauper immigrants from Ireland are its chief victims; but it also affects the Irish pensioners, whose means must have kept them above the minimum of diet to which the former had been reduced by the famine; finally, it invades the officers and seamen of the ships which bring them over, and the physicians and nurses who wait upon them after their arrival. A great number die on the voyages, and many arrive ill; but it has been observed at Gros Isle that a large number are attacked soon after being landed. Others remain well and are sent on to Quebec, where a portion of them are taken down, while others escape till they reach Montreal or the towns above. When at Oswego, in the State of New York, on my way out, I saw a number of cases.

It affects men rather more than women, and adults more than children; hence it has increased the proportion of infants on the banks of the St. Lawrence to an unprecedented extent. I have already mentioned the mortality of the physicians at Gros Isle, a seventh of whom have died. In the marine hospital of Quebec, nine or ten of the old nurses have perished, and others are disabled, so that there is not now one on duty who was there before the fever was introduced. In the sheds both there and here, but especially there, the crowd of patients is so great that one, as I have said, can hardly turn round among them, and in several of them men, women and children are indiscriminately huddled together. As the government has not undertaken to furnish them with clothing, most of them lie in the foul and tattered garments which they wore during the voyage, and perhaps long before. Now, whether the disease is propagated by a gas developed chemically from the organic matter which surrounds them, or by a morbid aeriform secretion from their bodies, we are at no loss to account for the sickness of physicians and nurses. On the question of its spread beyond the sheds and hospitals I have sought for information. The medical gentlemen with whom I have conversed, without a single exception, are of opinion that it can be communicated by fomites, and cite instances of its appearing in families which had never communicated with any of the wards, but had employed those who had recovered from attacks. In the private hospital of Drs. Douglas and Racey, where there is cleanliness, free ventilation and ample space, very few of the attendants are attacked. On the whole, it appears to me that its mode of propagation should still be kept *sub judice*.

2. After seeing patients in every stage of the fever, and conversing with the gentlemen whom I have named, I may venture to give the following desultory account of its symptoms and progress:

Most of the cases are not seen in the beginning by physicians, and no

reliable accounts can be got of them; but on the whole, the majority seem to sicken gradually; and in reference to those who had been greatly reduced by famine, this is perhaps always the case. There are, however, many examples of sudden and violent invasion, followed by a malignant development, and death in a few days. In no instance does the chill become very intense, though it may be protracted, nor is the arterial reaction high. In some cases the latter, in fact, never manifests itself—the vital forces being inadequate to a rally. The pulse is never tense, and in the highest reaction always easily compressible; its frequency is increased, but not to a remarkable degree; it often becomes almost imperceptible in those who recover. From the beginning, the primæ viæ are more or less, but variously disordered. In some there is nausea and vomiting; in all, loss of appetite, with thirst. Some are costive in the forming stage, and even throughout the fever; in others there is a *precursory* diarrhœa; in the majority, a *supervening* diarrhœa or actual dysentery. I could not ascertain that there is generally a superabundant excretion of bile. The tongue at the onset is always covered with white fur, through which the red papillæ sometimes show themselves; in a part, the edges and tip of the organ show some unnatural redness, but in the greater number the natural color is not exalted, but even reduced, so that the white fur seems to shoot out of a pallid membrane. At the same time the organ becomes broader and flatter, loses its elasticity, and receives indentations from the teeth, on which I seldom saw any sordes. Its moisture continues in a remarkable degree; it may be reduced, but not to the point of dryness; and the whiteness of the fur endures to a period equally late. The dry, contracted, mahogany tongue of genuine typhus often appears, it is true; but in numerous instances the moist and pale state of the organ continues up to the time of dissolution. The usual inequality of heat between the upper and lower parts of the body is common. I saw many patients in which the latter were cold, and some in which the former were decidedly hot; but great development of caloric is not, I think, a constant phenomenon. Delirium is more prevalent than coma; many patients during the night, when it is greatest, are restless and even locomotive, becoming the next day composed and of sound mind. Somnolency did not appear to me to be a conspicuous symptom. Headache is often present. Of the red and dull eye I saw much less than I had expected. A circumscribed flush of the cheek is frequent, but not universal. A bilious tinge of the visage occasionally shows itself. Subsultus tendinum is comparatively rare. I saw many who seemed to be almost in *articulo mortis*, and yet showed little or none of that symptom.

The skin shows various kinds of macule. In a few, genuine rose-colored spots show themselves, but very soon assume a darker color. In the majority, the spots are purple from their first appearance, and of every size

from ordinary petechiæ up to diffused echymoses, often bearing a close resemblance to post-mortem hyperæmias. In some cases the spots are hard like whelks, and the seat of a sensation which leads the patient to scratch them, whereupon ulcers follow, which occasionally assume a sloughing character. Hemorrhages from the nose are somewhat common, from the bowels and skin not quite so frequent; nevertheless all the medical gentlemen have had cases of well marked purpura hæmorrhagica mixed up with the fever cases; and it may be safely affirmed that in these immigrants the blood, under the influence of a reduced or unhealthy diet, has become signally deteriorated.

When the fever assumes a protracted form, anasarcous infiltrations into the cellular tissue of the lower extremities or the face frequently take place. Suppurations, in addition to those of the skin just mentioned, are common. Those about the back and hips may be ascribed to pressure; but others, occurring in glands, must be referred to the fever. Of these organs, the parotids suffer oftener than all the rest, and the discharge of pus when they suppurate, is copious. Such cases generally end well.

A supervening bronchial or pulmonary affection is, on the other hand, ominous, and as it frequently occurs, may be considered one of the modes in which the fever comes to a fatal termination.

But of all the secondary affections, that of the bowels is most frequent and fatal, though death may not occur for a considerable time after the febrile period has expired. This intestinal disorder seems to be a sort of mixed up diarrhea and dysentery, under which the patient loses the original febrile symptoms, and, becoming extremely emaciated, gradually sinks. In some instances this affection sets in during the fever; in others it is excited in the period of convalescence by irregularities of diet; in all it is an ugly, obstinate and unmanageable *addendum*. In the months of June and July it was much less frequent than at the present time, when so large a proportion of the patients labor under it as almost to constitute it a new act in the melancholy drama.

I have mentioned the nocturnal delirium of some patients, indicating an exacerbation at night, and may add to this evidence of periodicity that in a few cases there has been a diurnal recurrence of the initial chilliness: the general character of the fever, however, is continued. I have spoken of cases which prove fatal in three or four days; they are few in number, and the common duration is from two to three weeks, always excepting those which merge in diarrhea or dysentery, when the end is quite indefinite.

When death is the consequence of cerebral, pulmonary, hepatic or intestinal concentration, the reason of its occurrence is intelligible enough; but the majority do not seem to die from these lesions, and the cause of their dissolution is, *prima facie*, rather obscure. In every ward that I visited I

was surprised at the small amount of visible manifestation of dangerous disease, and more than once was prompted to say to the medical gentlemen, "I can't see why so many of your patients die." In wards from which many corpses were daily carried out, there would be but few who did not look at and after us, put out their moist tongues with facility, and make known their wants; yet many such patients die soon afterwards; others die when the physician has pronounced them convalescent; others after they have risen and dressed themselves, and crawled into the open air. Such deaths cannot be regarded as the effect of any particular organic lesion, but of a state of exhaustion or collapse, bearing some resemblance to the third stage of yellow fever, or the recurring chill of a malignant intermittent in the South-west, but more, perhaps, to the fatal stage of epidemic cholera.

After this imperfect, but I believe not unfaithful sketch of the history of this fever, I must proceed to its cure:

3. It is a maxim with the physicians of Gros Isle and Quebec, that a great amount of medication is inadmissible in this malady. Scarcely a patient is ever brought to them while the fever is still in its forming stage, so that there are but few opportunities of knowing whether art could arrest it in that stage. Once established in the system, the general opinion is that it cannot be cut short. The treatment then is merely palliative and corroborative.

By all the physicians in almost every case the lancet is repudiated, even when the patients are commanders of ships, and seamen, in whom famine had not preceded the attack. Local bleeding is almost as little employed, the majority of the physicians preferring counterirritants when the brain or the lungs are affected.

Emetics are prescribed by some, who speak well of their effects; but others think they predispose to congestions of the brain. It has not been observed by any that they break up the disease.

All employ cathartics, but the kinds and the degrees of their administration present considerable variety, into which, however, I shall not enter, as drastic or long continued purging is condemned by the whole,

Of sweating I can say nothing, for the patients generally are placed under such circumstances as preclude a resort to it.

A standard or standing febrifuge mixture at Gros Isle, as given me by the apothecary, Mr. Barton, is the following. ℞. Sod. et pot. tart. ℥ij; liq. ammon. acet. ℥jss; spt. ether. nit. ℥ss; aquæ commun. ℥xij. Misce. Another is composed of the camphorated mixture, tincture of hyoscyamus and tartar emetic.

Some of the medical gentlemen attach but little value to this class of medicines, and rely, during the more acute stages of the fever, chiefly on

free dilution, but advise against the addition of acids, as likely to irritate the bowels into diarrhea.

Opium is not in much favor in any stage of the fever. At a comparatively early period some physicians commence the administration of wine and aliment—a practice condemned by others, as dangerous to the brain; but all concur in this, that sooner or later, and sometimes quite early, there comes a pathological condition which demands prompt and energetic stimulation. In this resort a choice of means is not to be neglected. Of the whole materia medica, camphor is the most reliable. It is given in doses of ten, twenty, or even thirty grains, and often arrests the sudden sinking of the powers of life, and determines a speedy recovery. At the same time, alcoholic stimulants, sulphate of quinia, food and sinapisms are employed.

For the diarrhea and dysentery, the cretaceous mixture, hydrarg. cum creta, astringents, and diluted nitric acid, with laudanum, are the usual prescriptions.

MONTREAL, September 3.

A large number are sick in the sheds at this place, attacked, of course, after they had left the quarantine ground. A great proportion of them are said to have dysentery. The deaths are numerous. The fever here is by no means confined to immigrants, but has invaded the city and added greatly to its ordinary summer mortality. Its victims, however, are largely of that class which, living near the wharves, received and mingled with the immigrants before sheds were provided for their reception. In conversing with several of the most intelligent physicians here, I find the treatment to be substantially the same as at Gros Isle and Quebec; but latterly, as Dr. Badgely informed me, increasing reliance is placed on nitric acid. He uses the following formula: ℞. Acid. nitr. ℥j; alcohol, ℥iv; aquæ, ℥iv. Misce. An ounce is to be given every hour, beginning early in the disease and without much preparation of the system. Under its administration, he and other gentlemen have, as he assured me, seen the pulse rapidly reduced in frequency, with a corresponding abatement of all the febrile symptoms.

When at Gros Isle, I inquired as to *post-mortem* inspections, and could hear of only two. They were made by Dr. Watt, who found the liver engorged, and, as he believed, fatty. The state of the organs convinced him that the one mentioned suffered more than any other, which led him to prescribe purges of calomel and gamboge. In Quebec I could not learn that any dissections had been made. In this city Dr. Fraser has published, in the July number of Dr. Hall's valuable "British American Journal of Medical and Physical Sciences," a short paper, in which he says:

"The morbid appearances found on dissection are venous congestion,

with effusion of serum on the surface, in the ventricles, and base of the brain, but no trace of active inflammation. When the case has been complicated with bronchitis, I have found the bronchial mucous membrane throughout tumid, swollen, highly vascular, and containing much mucus; the vascularity extending to the submucous tissue, with congestion and partial hepatization of portions of the lungs. When diarrhea has existed, the small intestines, especially the lower portion of the ileum, has presented the appearance of active congestion of its mucous coat, which was slightly thickened without being softened; some patches had the appearance of sanguineous extravasation, not unlike the maculæ observed on the skin. When the patient had a jaundiced appearance, a common occurrence in this epidemic, I have found the liver enlarged from congestion, presenting a bloody and bilious appearance when cut into, and the gall-bladder distended with inspissated bile thick enough to maintain its form when deprived of its covering. When there has been only a slight bilious tinge of the skin and conjunctivæ, the liver presented the same appearance in a less degree, the bile in the gall-bladder being about the consistence of treacle."

Dr. Frazer does not tell us how many autopsies he had made, and we cannot but regret that so little has been done where the opportunities are so great. It may be given in extenuation, however, that the physicians in attendance are overworked, and that many of them have been ill with the fever.

I have no time to give you the statistics of this disease, had I been able to collect full data. The number of deaths in proportion to that of the cases never will be known, as nearly every form of disease in the immigrants goes very much under one name. I may say in general terms, the mortality has been and still continues to be very great. Take the following as specimens: At Gros Isle, for the week preceding the 24th of August, the number of patients averaged more than 2000, and the deaths amounted to 288. In the marine and emigrant hospital at Quebec, the average for the week ending the 21st of August was about 850, the deaths 166; to which might be added 34 said to have died of dysentery, a sequel of the fever. The Montreal returns would be about the same, and present in the aggregate about 100 deaths a day at these places. At Gros Isle alone, up to the 20th of August, the deaths had amounted to 2116. The disease had then prevailed about three months. A portion of them, however, have resulted from smallpox, which has prevailed to a considerable extent on the Island, and more or less, I believe, in Quebec and Montreal—certainly in the latter, where I saw it in the general hospital.

The British government has lately made an effort to arrest the fever by disinfecting agents. Dr. Stratton, of the royal navy, but sojourning in Upper Canada, has been commissioned to this enterprise, and arrived in

Quebec while I was there. He was advised that two agents would be forwarded to him. One proved, on opening the package, to be Sir William Burnett's patent disinfecting fluid; the other, a small bale of dresses for a lady! which had been forwarded from Halifax (by mistake) instead of Ledoyen's disinfecting fluid. The former—of which Dr. Stratton kindly presented me with a small vial, which I carry in my trunk as an amulet—is said by the medical gentlemen of this quarter to be a solution of the chloride of zinc; the latter, according to Dr. Hall, is a liquor of nitrate of lead. When I left Quebec, arrangements were making for experiments in the marine hospital, but its physicians seemed to think lightly of the practical value of such measures. When I was at Gros Isle, Dr. Douglas, the quarantine physician, sagaciously remarked that the proper place for such experiments is an emigrant ship on her voyage.

I shall ascend the St. Lawrence from this place to Kingston and Toronto, reëntering our own country at Buffa'o. Whether I shall be able to send you another letter is uncertain, as I am admonished by a slight tinge of yellow in the woods that autumn is at hand, and that the opening duties of next winter are not, in time, very far off.

Respectfully, your colleague, D.

SILLIMAN'S CHEMISTRY.

Benj. Silliman, Jr., Professor, in Yale College, of Science as Applied to the Arts, is the author of a neat duodecimo volume on Chemistry, of nearly five hundred pages; and of the numerous treatises on this subject designed especially for the use of colleges and schools, we do not remember a single one superior to it in merit. It presents a clear, satisfactory view of the first principles of the science, just such as the student requires at the beginning, neither so minute in detail as to weary and perplex, nor so condensed as to be dry and unintelligible. We shall take great pleasure in recommending it to the students in the University of Louisville as a text-book, and are persuaded that a better work could not be placed in the hands of those about entering upon the study of chemistry. The illustrations, amounting to more than two hundred, will aid the student materially in comprehending the apparatus, processes and experiments described in the text. We cannot doubt that the work will be extensively introduced into our colleges and schools. Its publishers are Loomis and Peck, Philadelphia.

More than once we have expressed the belief that nearly all the elementary works on chemistry embraced too much, their very copiousness proving an embarrassment to the young student. This impression, we find, is gaining ground, and in the preparation of the work before us it is evident that the judicious author has borne this point in mind.